

ENVIRONMENTAL ASSESSMENT

Reducing Beaver Damage Through an
Integrated Wildlife Damage Management Program
in the
State of Illinois

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SUMMARY OF PROPOSED ACTION

The United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) proposes to administer and continue the current WS beaver (*Castor canadensis*) damage management program in the State of Illinois. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to reduce damage associated with beaver activities to property, agricultural and natural resources, and public health and safety. Damage management would be conducted on property in Illinois when the resource owners (property owners) or managers request assistance to alleviate beaver damage and fund the project. Some of the types of damage that resource owners seek to alleviate are: flooding of agricultural land and roads, prevention of road and railroad bed failure due to impounded water, protection of ornamental trees from cutting, protection of commercial trees and tree plantations from cutting and flooding, structural degradation of storm water ditches, protection of habitat for native wildlife and fisheries species and a reduction of wildlife hazards to aviation at airports. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and nontarget species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. In other situations, beaver would be removed as humanely as possible using: body-grip (e.g., Conibear-type) traps, snares, leg-hold traps, and shooting. When appropriate, beaver dams could be breached using binary explosives or by hand. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State, when requested and funded by the cooperator, on private or public property after an *Agreement for Control* or other comparable document has been completed. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, State and local laws.

NOTE: Upon examining this document, you will note that some information has been removed. This is in compliance with an injunction granted to the American Farm Bureau and Texas Farm Bureau (February 9, 2000), which states that Wildlife Services (WS) is restrained and prohibited from releasing to third parties any private information. The injunction identifies private information as “any information that allows the recipient of it to obtain or deduce the specific identity or personal identifying information of the entities who have requested, executed cooperative agreements with or otherwise allowed WS to enter their property for any purpose.” Third parties are “individuals, groups, agencies, including but not limited to animal rights groups.” Therefore, cooperators’ private information has been removed from the Environmental Assessment.

ACRONYMS

ADC	Animal Damage Control
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FY	Fiscal Year
IDNR	Illinois Department of Natural Resources
IWDM	Integrated Wildlife Damage Management
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NOA	Notice of Availability
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services

NOTE: On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife which increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (United States Department of Agriculture (USDA) 1997):

"Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well."

Wildlife damage management is the science of reducing damage or other problems caused by wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 1992). Wildlife Services (WS) uses an Integrated Wildlife Damage Management (IWDM) approach, known as Integrated Pest Management (WS Directive 2.105), in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1:1-7 of USDA (1997). These methods may include alteration of cultural practices and habitat and behavioral modification to prevent or reduce damage. The reduction of wildlife damage may require that the local populations of offending animal(s) be reduced through lethal means.

Biological carrying capacity is the land or habitat's limit for supporting healthy populations of wildlife without degradation to the animals' health or their environment over an extended period of time (Decker and Purdy 1988). Wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations (Decker and Purdy 1988). These terms are especially important in urban areas because they define the sensitivity of a local community to a specific wildlife species. For any given damage situation, there will be varying thresholds by those directly and indirectly affected by the damage. This threshold of damage is a primary limiting factor in determining the wildlife acceptance capacity. While the State of Illinois has a biological carrying capacity to support more than the current number of beaver, the wildlife acceptance capacity in specific areas may be much lower. Once the wildlife acceptance capacity is met or exceeded, people will request or begin to implement population or damage reduction methods, including lethal management methods, to alleviate property damage and public health or safety threats.

This environmental assessment (EA) documents the analysis of the potential environmental effects of a proposed beaver (*Castor canadensis*) damage management program conducted by WS in Illinois to achieve a balance between the biological carrying capacity and cultural carrying capacity. This analysis relies

mainly on existing data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997) to which this EA is tiered. USDA (1997) may be obtained by contacting the USDA, Animal and Plant Health Inspection Service (APHIS), WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

WS is the federal agency directed by law and authorized to protect American resources from damage associated with wildlife (Animal Damage Control (ADC) Act of March 2, 1931, as amended 46 Stat. 1486; 7 USC. 426-426c and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988, Public Law 100-102, Dec. 27, 1987. Stat. 1329-1331 (7 USC 426C)). To fulfill this Congressional mandate, WS activities are conducted to prevent or reduce wildlife damage caused to agricultural, industrial and natural resources, property, and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, private organizations, and individuals. As such, wildlife damage management is not based on punishing offending animals, but rather, seeks the resolution or alleviation of damage that is occurring through the implementation of various management strategies. The determination of the problem, selection of suitable management strategies and monitoring of efforts is diagramed in the WS Decision Model (Slate et al. 1992) (see Section 3.2.2). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public.

In accordance with the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions may be categorically excluded (7 CFR 372.5(c), 60 Fed. Reg. 6,000- 6,003 (1995)). WS has decided, in this case, to prepare this EA to facilitate planning, interagency coordination, streamlining program management, and to clearly communicate with the public the analysis of potential individual and cumulative impacts. Any wildlife damage management actions that may occur in Illinois will be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA). Notice of the availability of this document will be made available consistent with the agency's NEPA procedures.

WS is a cooperatively funded, service-oriented program from which other governmental agencies and entities may request assistance. Before any wildlife damage management is conducted, Cooperative Service Agreements, Agreements for Control or other comparable documents are in place. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently according to applicable federal, State and local laws and Memorandums of Understanding (MOUs) between WS and other agencies. WS' mission, developed through its strategic planning process, is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* WS' Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- Training of wildlife damage management professionals;
- Development and improvement of strategies to reduce losses and threats to humans from wildlife;
- Collection, evaluation, and dissemination of management information;
- Informing and educating the public on how to reduce wildlife damage;
- Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1999).

1.1 BEAVER ECOLOGY

The beaver is the largest North American rodent. Adult beavers generally weigh from 35-50 lbs., with individuals attaining weights of up to 100 lbs. The beaver has several physical adaptations for life in an aquatic environment; webbed rear feet, a prominent dorsoventrally flattened tail, valvular nose and ears, lips that close behind the four large incisor teeth and dense waterproof fur (Miller and Yarrow 1994).

Beavers are found throughout North America, except for arctic tundra, peninsular Florida and southwestern desert areas. The species may be locally abundant wherever suitable habitat is found (Miller and Yarrow 1994).

Beaver habitat is almost anywhere there is a year-round source of water and an adequate food source. Beavers modify their habitat by building dams to impound water to provide access to food sources and security. Dams are usually built of mud and sticks, but rocks, corn stalks and other available materials are also occasionally used (Miller and Yarrow 1994). Beavers build a house, or lodge, of mud and sticks, or inhabit a bank den for warmth, security and raising their young (Miller and Yarrow 1994).

Beavers eat the bark of a variety of trees and also feed on herbaceous and aquatic vegetation when it is available. In Illinois, tree species preferred by beaver are willow (*Salix spp.*), birch (*Betula spp.*) and alder (*Alnus rugosa*) (Langley and Moyle 1963).

Beavers are generally monogamous and live in family groups, sometimes mistakenly referred to as “colonies”, made up of a breeding pair and offspring from 1-2 previous generations, numbering 2-13 (Langley and Moyle 1963). These family groups are territorial and will defend their territory from other beavers (McNeely 1995). In northern areas, beavers usually mate in February and March with an average of 2-6 young being born approximately 105-107 days later (Novak 1987). Young beaver usually remain in their natal colony until sexual maturity at approximately 2 years old, when they disperse to suitable habitat and establish their own territory (Miller 1994).

Beaver densities vary according to food supply, harvest rates and other factors. The Illinois Department of Natural Resources (IDNR) does not conduct any surveys of beaver in Illinois but indicate that they may be found statewide (B. Bluett, IDNR, pers. comm.).

Beaver have few natural predators, aside from humans. Predators, including coyotes, bobcats, river otter, bears and mink, that may prey on the young, have been known to kill beaver (Miller and Yarrow 1994).

1.2 HISTORICAL BEAVER MANAGEMENT IN ILLINOIS

Historically, beaver harvests were unregulated and led to serious population declines by the late 1800's. In 1907, the State of Illinois provided the first protective harvest regulations for beaver. In 1933, beaver harvest seasons were closed due to decreased populations. The seasons reopened in 1951 following the recovery of the population. Currently, various population survey techniques are being analyzed by the IDNR to obtain statewide population estimates.

The IDNR uses the public beaver trapping harvest during the open beaver season as its primary tool to manage beaver damage in the State. During the period of 1975-1999, annual statewide beaver harvests ranged from 1,548 - 9,406 per year in Illinois, with a mean of 4,405 beaver per year.

In addition to the regular harvest season, the IDNR issues Nuisance Animal Removal Permits to landowners or their agents to remove beaver causing damage. During the calendar years of 1996 through 1999, the IDNR issued 540 permits statewide, resulting in 6,450 beaver being handled (IDNR Furbearer Program Management Notes).

In 1999, in response to a growing number of requests for assistance, WS began providing operational and technical beaver damage management assistance (in a limited area) to private landowners, [REDACTED], municipal governments and railway companies. WS personnel recommended and employed an integrated damage management strategy to apply a variety of methods for alleviating or reducing the damage caused by beaver.

1.3 BEAVER ACTIVITY IMPACTS TO THE ENVIRONMENT AND SOCIETY ATTITUDES

1.3.1 Benefits of Beaver Activities

Although beaver may cause extensive damage, there are also benefits associated with their activities depending on the activities and location. Beaver ponds create valuable palustrine wetland habitat that provides habitat for many species of fish and wildlife (Arner and Hepp 1989, Hill 1982, Novak 1987). These wetland ecosystems also function as sinks, helping to filter nutrients and reduce sedimentation, thereby maintaining the quality of nearby water systems (Arner and Hepp 1989). According to the EPA, wetlands can provide aesthetic and recreational opportunities for wildlife observation, nature study, hunting, fishing, trapping, wildlife photography, livestock water, and environmental education and added an estimated \$59.5 million to the national economy in 1991 (EPA 1995, Woodward 1983, Wade and Ramsey 1986).

Beaver pond wetland habitats can be valuable and productive ecosystems (Arner and Hepp 1989). Beaver ponds contribute to the stabilization of water tables, help reduce rapid run-off from rain (Wade and Ramsey 1986) and serve as basins for the entrapment of streambed silt and eroding soil (Hill 1982). Silt-laden waters, particularly carrying eroded soil from cultivated, logged, excessively grazed, farmed, mountainous, or developed areas, slow as they pass through a series of beaver ponds and the heavier particles and colloids are able to settle out before the water flows into larger streams (Hill 1982). Aquatic and early successional plant species may become established in the newly deposited sediment, allowing conditions to become favorable for the stabilization of the flood plain by more permanent woody vegetation (Hill 1982).

Producing wetlands/marsh habitat through beaver management in New York was far less costly than developing either small or large manmade marshes, assuming the quality is equal in each case (Erner 1984). Beaver ponds may also improve soil quality and provide improved habitat for fish and invertebrates. The anaerobic conditions caused by beaver impoundments may result in the accumulation of ammonium, so that soil storage of inorganic nitrogen is nearly tripled by beaver impoundments during a 50-year period (Johnston 1994). Arner et al. (1969) found that the bottom soils of beaver ponds in Mississippi were generally higher in phosphate, potash, and organic matter than the bottom soils of feeder streams. Greater biomass of invertebrates were also found in beaver ponds than in feeder streams (Arner and DuBose 1982).

Habitat modification by beavers, primarily dam building and tree cutting, can benefit many species of wildlife (Jenkins and Busher 1979, Medin and Clary 1990, Medin and Clary 1991, Arner and

DuBose 1982, Arner and Hepp 1989, Hill 1982). Beavers may increase habitat diversity by flooding and opening forest habitats, which results in greater interspersions of successional stages and subsequently increases the floral and faunal diversity of a habitat (Arner and Hepp 1989, Hill 1982). The creation of standing water, edge and plant diversity, all in close proximity, results in excellent wildlife habitat (Hill 1982). The resulting wetland habitat may be beneficial to some other mammals, fish, reptiles, amphibians, waterfowl, and other birds (Arner and DuBose 1982, Miller and Yarrow 1994, Naimen et al. 1986). When the ponds are abandoned, they progress through successional stages which improve feeding conditions for white-tailed deer (*Odocoileus virginianus*) and woodcock (*Philoela minor*) (Arner and DuBose 1982). Beaver ponds may also be beneficial to threatened and endangered (T&E) species, because the U.S. Fish & Wildlife Service (USFWS) estimates that up to 43% of the T&E species rely directly or indirectly on wetlands for their survival (EPA 1995).

Waterfowl use beaver pond wetland habitats extensively (Arner and Hepp 1989, Speake 1955, Arner 1964, Novak 1987, Hill 1982). In particular, wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), black ducks (*Anas rubripes*), and other dabbling ducks benefit from the increased interspersions of cover and food found in flooded beaver ponds (Novak 1987, Arner and Hepp 1989). Also, the attraction of a beaver pond to waterfowl varies with age and vegetation (Arner and DuBose 1982). In Mississippi, beaver ponds over three years in age were found to have developed plant communities which increase their value as nesting and brood rearing habitat for wood ducks (Arner and DuBose 1982). However, Reese and Hair (1976) found that beaver pond habitats were highly attractive to a large number of birds year-round and that the value of the beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). Beaver are generally considered beneficial where their activities do not compete with people's use of the land or property (Wade and Ramsey 1986). The opinions and attitudes of individuals, communities, organizations, etc., vary greatly and are primarily influenced and formed by the benefits and damage directly experienced by each person or entity (Hill 1982). Property ownership, options for public and private land use, and the effects on adjacent properties or land use impact public attitudes toward beavers (Hill 1982). In many cases, the beaver damage exceeds the benefits, resulting in a demand for beaver damage management. Woodward et al. (1976) found that 24% of landowners who reported beaver activity on their property indicated benefits to having beaver ponds on their land and also desired assistance with beaver pond management (Hill 1976, Lewis 1979, Woodward et al. 1985).

1.3.2 Damage from Beaver Activities

Miller (1983) estimated that the annual damage in the United States was \$75-\$100 million. The value of beaver damage is perhaps greater than that of any other single wildlife species in the United States and was estimated to have exceeded \$4 billion in the southeastern U.S. over a 40-year period (Arner and Dubose 1979). In some southeastern states, losses from beaver damage have been estimated at \$3 million to \$5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1982).

In Illinois, beaver cause significant damage primarily as result of dam building and subsequent flooding, bank burrowing, tree cutting and obstructing overflow structures and spillways. Damage by beavers also affect fish and wildlife habitat and railroad transportation and aviation safety.

Beaver damage to roads has been well documented (Miller and Yarrow 1994) and occurs in Illinois. Damage occurs when beavers plug a culvert under a road with mud, sticks and other material, causing the water to flow into the roadbed or over the road, instead of under the road, through the culvert. In some cases, during large rain or snow melt events, roads can actually be washed out due to the water flowing over/through the road. The other type of beaver damage to roads is also caused by beaver dams, either at or downstream from the road, this causes water levels to rise to the point where the roadbed is saturated and prone to sloughing where portions of the road surface can fall into the water. These types of road damage can cause hazardous situations for vehicular travel on such roads. In New York, an estimated 19 workdays and \$2,500 in repair costs were incurred for each culvert obstructed by beaver activity (Jensen et. al. 1999).

Railroad beds are also impacted in the same way by beaver dams. At least one train derailment is known to have been related to a beaver dam causing damage to the tracks (Miller and Yarrow 1994).

Beavers damage agricultural fields and pastures primarily by flooding, but also by direct cutting of crops such as corn and soybeans, for food and dam building material.

Beaver damage to timber comes in two forms. First and most significant is damage caused by flooding of standing live timber. Upland tree species most commonly harvested for pulp/paper making, saw timber and other forest products usually die if flooded for more than one growing season. Beaver also directly damage standing timber by cutting down trees for food or dam and house building activities. Beaver cause damage to standing timber by gnawing or “barking” live trees to consume the cambium layer of the trees just under the bark (Jenkins and Busher 1979) or expose pitch from pine trees to lick (Svendsen 1980) which can stress or kill the trees.

Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986).

Dam building activities near airports causes flooding which may attract waterfowl, wading birds and other wildlife that may pose a threat to aviation safety (Transport Canada 1994). There is an estimated \$300 million of damage from wildlife strikes annually in the U.S. to U.S. civil aircraft and 68 people have been killed in wildlife related aviation accidents in the U.S. and Europe since 1995 (Steenblik 2000).

Surveys in North Carolina and Alabama indicate that the majority of landowners with beaver damage on their property desire damage management via beaver removal (Hill 1976, Lewis 1979, Woodward et al. 1985). Loker et al. (1999) found that suburban residents may also desire lethal management methods to resolve beaver damage conflicts. Such conflicts, which are viewed as “*damage*,” result in adverse impacts that often outweigh benefits (Miller and Yarrow 1994).

1.3.3 Public Health and Safety Risks from Beaver Damage

Beavers are hosts for several ectoparasites and internal parasites including nematodes, trematodes, and coccidians. The general activity of beavers can also pose a threat to public health and safety

(e.g., burrowing into or flooding of roadways and railroad beds can result in serious accidents) (Miller 1983, Woodward 1983). Increased water levels in urban areas resulting from beaver activity can lead to unsanitary conditions and potential health problems by flooding septic systems and sewage treatment facilities (DeAlmeida 1987, Loeb 1994). Beaver damming activity also creates conditions favorable to mosquitoes and can hinder mosquito control efforts or result in population increases of these insects (Wade and Ramsey 1986). While the presence of these insects is largely a nuisance, mosquitoes can transmit diseases, such as West Nile Virus, a form of encephalitis (Mallis 1982). In addition, beaver, which are carriers of the intestinal parasite *Giardia lamblia*, can contaminate human water supplies and cause outbreaks of the disease Giardiasis, or giardia, in humans (Woodward 1983, Beach and McCulloch 1985, Wade and Ramsey 1986, Miller and Yarrow 1994). The Centers for Disease Control have recorded at least 41 outbreaks of waterborne Giardiasis, affecting more than 15,000 people. Beaver are also known carriers of tularemia, a bacterial disease, that is transmittable to humans through bites by insect vectors or infected animals or by handling animals or carcasses which are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle ranching sections of Wyoming, the fecal bacterial count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationists. On rare occasions, beaver may contract the rabies virus and attack humans. In February 1999, a beaver attacked and wounded a dog and chased some children that were playing near a stream in Vienna, Virginia. Approximately a week later, a beaver was found dead at the site and tested positive for rabies (USDA 2000).

1.4 SCOPE AND PURPOSE OF THIS EA

The scope and purpose of this EA is to evaluate the potential impact from WS beaver damage management to protect agricultural and natural resources, property, and public health and safety in Illinois. Damage problems can occur throughout the State, resulting in requests for WS assistance. Under the Proposed Action, beaver damage management could be conducted on private, federal, state, tribal, county, and municipal lands in Illinois. In Fiscal Year (FY) 1999, WS was requested to assist the [REDACTED] with a situation in southern Illinois where beaver activity raised the level of a lake, causing water to back up into a town, flooding basements during rainy seasons. Through the public commenting period for the EA prepared by the [REDACTED], it was made clear that problems with beaver are occurring in other areas, necessitating action to resolve beaver conflicts. This EA evaluates the need for action, possible management strategies to be used to resolve any damage issues and the role of WS, if any, in assisting with the resolution of complaints. Illinois encompasses about 35,579,520 acres. Under the Preferred Alternative, WS anticipates that the proposed action would occur on no more than 0.01% of the land in Illinois and no more than 1,000 beaver would be removed by IL WS annually. This estimate is based upon anticipated requests for assistance for WS beaver control activities.

1.5 NEED FOR BEAVER DAMAGE MANAGEMENT IN ILLINOIS

The need for action in Illinois is based on the necessity of having a program to protect agricultural and natural resources, property, roads, bridges, railroads, and public health and safety from beaver damage. Beaver populations can have a negative economic impact and can be a threat to human health and safety in Illinois. Currently, IDNR provides technical assistance, provides Nuisance Animal Removal Permits to remove beaver outside of the open season, and has a fur harvest season (November 5 - March 31) for the

management of beaver and beaver related problems in the State. The IDNR does not provide direct control assistance to property owners within the State due to time and funding constraints. The proposed action gives the property owner or manager the opportunity and option to have a government agency conduct beaver management activities on their properties. At times, this option is desired by the property owner or manager due to the special expertise and services that WS can provide while insuring compliance with State and federal regulations. An example would be providing both beaver removal and dam removal services at the same time. This combination of services is often not available from private individuals or trappers.

Comprehensive surveys of beaver damage in Illinois have not been conducted. An estimate of the magnitude of damage can be derived from the number of Nuisance Animal Removal Permits issued by the IDNR. In the years 1996-1999, the IDNR issued 540 permits to private landowners to control damage caused by beaver. As such, beaver was the second ranked species for number of permits being issued, above squirrels and groundhogs, with raccoons topping the list. Damage estimates for these occurrences were not recorded.

1.6 PROPOSED ACTION

WS proposes to administer a beaver damage management program in the State of Illinois. An IWDM approach could be implemented to reduce damage associated with beaver activities to property, agricultural and natural resources, and public health and safety on all lands in Illinois where a need exists and a request is received and cooperator funding is available. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and nontarget wildlife, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992) (see Section 3.2.3). When appropriate, physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. In other situations, beaver would be removed as humanely as possible using available management alternatives. When appropriate and necessary, beaver dams would be breached using binary explosives or by hand. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, State and local laws.

1.7 OBJECTIVES FOR THE ILLINOIS WS BEAVER DAMAGE MANAGEMENT PROGRAM

1.7.1 Attempt to balance the needs of the beaver as a dynamic part of the ecosystem and a fur resource, with the need to minimize damage to human interests.

1.7.2 Respond to all beaver damage problems within 2 (two) weeks.

1.7.3 Minimize the take of non-target animals, such as otters (*Lutra canadensis*), keeping non-target take below 0.5% of the total take of animals during beaver damage management operations.

1.8 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

1.8.1 ADC Programmatic EIS. WS has issued a final EIS (USDA 1997) and Record of Decision on the National APHIS-WS program. This EA is tiered to that EIS.

1.9 DECISIONS TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should an integrated beaver damage management program implemented by WS be conducted in Illinois?
- If not, should WS attempt to implement one of the Alternatives to an IWDM strategy as described in the EA?
- Would the proposed action have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.10 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.10.1 Actions Analyzed. This EA evaluates beaver damage management to protect property, agricultural and natural resources, roads, bridges, railroads, and public health and safety in Illinois.

1.10.2 Wildlife and Fisheries Species Potentially Protected by Illinois WS. Illinois WS assistance may be requested to achieve management objectives for native wildlife and fisheries, including T&E species. If other needs are identified, a determination would be made on a case-by-case basis if additional NEPA analysis is needed.

1.10.3 American Indian Lands and Tribes. Illinois WS has not been requested to conduct beaver damage control work on tribal lands in the State. Currently WS does not have any MOUs or signed agreements with any American Indian tribe in Illinois. If WS enters into an agreement with a tribe for beaver damage management, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA.

1.10.4 Period for which this EA is Valid. This EA would remain valid until Illinois WS and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year to ensure that the EA is sufficient.

1.10.5 Site Specificity. This EA analyzes the potential impacts of beaver damage management and addresses activities on all lands in Illinois under MOU, Cooperative Service Agreement, and in cooperation with the appropriate public land management agencies. It addresses the impacts of beaver damage management on areas where agreements may be signed in the future. Because the proposed action is to reduce damage caused by beaver and because the programs goals and

directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that beaver damage management efforts will occur. Therefore, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program. This EA emphasizes major issues as they relate to specific areas whenever possible. However, many issues apply wherever beaver damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Illinois (see Chapter 3 for a description of the Decision Model and its application).

1.10.6 Public Involvement/Notification. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through “Notices of Availability” (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues used to develop mitigation measures and SOPs, and issues not considered in detail, with the rationale. Pertinent portions of the affected environment are included in this chapter in the discussion of issues used to develop mitigation. Additional affected environments are incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program in Chapter 3.

2.1 AFFECTED ENVIRONMENT

The areas of the proposed action could include any property, public or private, where beaver damage is occurring in the State and a request for assistance is made.

2.2 ISSUES ANALYZED IN DETAIL IN CHAPTER 4

The following are issues that have been identified as potential areas of concern requiring consideration in this EA and were used to develop mitigation measures:

- Effects on beaver populations;
- Effects on native fish, wildlife and plant species, including T&E species;
- Effects on public and pet health and safety;
- Humaneness of methods to be used; and
- Impacts to stakeholders, including aesthetics.

2.2.1 Effects on beaver populations.

A common concern is whether the proposed action or any of the Alternatives would result in the loss of local beaver populations or could have a cumulative adverse impact on regional or statewide beaver populations.

2.2.2 Effects on native wildlife and plant species, including T&E species.

A common concern among members of the public and wildlife professionals, including WS personnel, is that the proposed action or any of the Alternatives would result in removing individuals or adverse impacts to populations of native fish or other wildlife species, particularly T&E species. Appendix D provides a current listing of T&E species found in Illinois, including federally and State listed species. WS' mitigation and SOP's that are designed to reduce the adverse effects on non-target species and to avoid jeopardizing T&E species populations and are presented in Chapter 3.

Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of WDM methods on T&E species and has obtained a Biological Opinion (B.O.).

For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS is also in the process of reinitiating Section 7 consultation at the program level to assure that potential effects on T&E species have been adequately addressed.

2.2.3 Effects on public and pet health and safety.

A common concern is whether the proposed action or any of the Alternatives pose an increased threat to public and pet health and safety. In particular, there is concern that the lethal methods of beaver removal (i.e., trapping and shooting) and explosives used in dam removal may be hazardous to people and pets or that continued increases in beaver populations might threaten public and pet health or safety.

2.2.4 Humaneness of methods to be used.

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Kellert and Berry (1980) in a survey of American attitudes toward animals related that 58% of their respondents, “... *care more about the suffering of individual animals ... than they do about species population levels.*” Schmidt (1989) indicated that vertebrate pest control for societal benefits could be compatible with animal welfare concerns, if “... *the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*”

The American Veterinary Medical Association (1987) describes suffering as a “... *highly unpleasant emotional response usually associated with pain and distress*”. The American Veterinary Medical Association (AVMA) (1987) further states that suffering “... *can occur without pain ...*” and “... *pain can occur without suffering ...*” Since the concept of suffering carries with it the implication of a time frame, a case could be made that there is “... *little or no suffering where death comes immediately ...*” (CDFG 1991), as in situations where taking involves shooting.

Defining pain as a component of humaneness may be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain and identifying the causes that elicit pain responses in humans would “... *probably be causes for pain in other animals ...*” (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). Some WS damage management methods, such as leg-hold traps and body snares, may thus cause varying degrees of pain in different animal species for varying time frames. At what point pain diminishes or stops under these types of restraint has not been measured by the scientific community.

Pain and suffering as it relates to a review of WS damage management methods to capture animals, has both a professional and lay point of arbitration. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since “... *neither medical or veterinary curricula explicitly address suffering or its relief*” (CDFG 1991).

Research suggests that with some methods, such as restraint in leg-hold traps, changes in the blood chemistry of trapped animals indicate “*stress*” (USDA 1997: 3-81). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

The AVMA states “... *euthanasia is the act of inducing humane death in an animal.*” and “... *the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness.*” (Andrews et al 1993).

Some people would prefer AVMA accepted methods of euthanasia to be used when killing all animals, including wild and feral animals. The AVMA states that “*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but use terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible.*” (Andrews et al 1993).

The decision-making process involves tradeoffs between the above aspects of pain and humaneness. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans if damage management methods were not used. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some wildlife damage management methods are used in situations where non-lethal damage management methods are not practical or effective.

Illinois WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures/Standard Operating Procedures (SOP) used to maximize humaneness are listed in Chapter 3. As appropriate, WS euthanizes live animals by methods recommended by the AVMA (Andrews et al. 1993) and IDNR.

Some people are concerned about beaver that drown while restrained by leghold traps and these people consider drowning inhumane. There is considerable debate and disagreement among animal activist, some veterinarians, wildlife professionals, fur trappers, and nuisance wildlife control specialists on this issue. The debate centers around an uncertainty as to whether the drowning animals are rendered unconscious by high levels of CO₂ and are thus insensitive to distress and pain (Ludders et al. 1999). The AVMA identifies drowning as an unacceptable method of euthanasia (Andrews et al. 1993), but provides no literature citations to support this position. Ludders et al. (1999) concluded drowning is not euthanasia based on the animals not dying from CO₂ narcosis. Ludders et al. (1999) reported CO₂ narcosis does not occur until 95 millimeters of mercury in arterial blood is exceeded. Ludders et al. (1999) showed death during drowning is from hypoxia and anoxia, and thus animals experience hypoxemia. Ludders et al. (1999) also concluded that animals that drown are distressed because of stress related hormones, epinephrine and norepinephrine, and therefore drowning is not euthanasia.

Carbon dioxide (CO₂) causes death in animals by hypoxemia and some animals (cats, rabbits, and swine) are distressed before death (Andrews et al. 1993). Even though these animals are

distressed, the AVMA (Andrews et al. 1993) states this death is an acceptable form of euthanasia. Thus, the AVMA does not preclude distress or pain in euthanasia. In fact, the AVMA supports inducing hypoxemia related distress when necessary to reduce total distress, because reducing total distress is a more humane death.

Death by drowning in the classical sense is caused by the inhalation of fluid into the lungs and is referred to as “wet” drowning (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that all submerged beaver do not die from wet drowning, but die of CO₂ induced narcosis, and the AVMA has stated the use of CO₂ is acceptable (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that after beaver were trapped and entered the water, they struggled for 2-5 minutes followed by a period of reflexive responses. Andrews et al. (1993) states that with some techniques that induce hypoxia, some animals have reflex motor activity followed by unconsciousness that is not perceived by the animal. Gilbert and Gofton (1982) state it is unknown how much conscious control actually existed at this stage. And they stated anoxia may have removed much of the sensory perception by 5-7 minutes post submersion.

However, Gilbert and Gofton (1982) have been criticized because levels of carbon dioxide in the blood were not reported (Ludders et al. 1999) and there was insufficient evidence that the beaver in their study were under a state of CO₂ narcosis when they died (V. Nettles, Southeastern Cooperative Wildlife Disease Study, letter to W. MacCallum, Massachusetts Division of Fisheries and Wildlife, June 15, 1998). Adding to the controversy, Clausen and Ersland (1970) did measure CO₂ in the blood for submersed restrained beaver, yet none of the beaver in their study died, so Clausen and Ersland (1970) could not determine if beavers die of CO₂ narcosis. Clausen and Ersland (1970) demonstrated that CO₂ increased in arterial blood while beaver were submersed and CO₂ was retained in the tissues. While Clausen and Ersland (1970) did measure the amounts of CO₂ in the blood of submersed beaver they did not attempt to measure the analgesic effect CO₂ of buildup to the beaver (letter from V. Nettles, D.V.M., Ph.D., Southeastern Cooperative Wildlife Disease Study to W. MacCallum, MA Division of Fisheries and Wildlife, June 15, 1998).

When beaver are trapped using leg-hold traps with intent to “*drown*”, the beaver are exhibiting a flight response. Gracely and Sternberg (1999) report that there is stress-induced analgesia resulting in reduced pain sensitivity during fight or flight responses. Environmental stressors that animals experience during flight or fight activate the same stress-induced analgesia (Gracely and Sternberg 1999).

The use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic mammals such as beaver. Trapper education manuals and other wildlife damage management manuals written by wildlife biologists recommend drowning sets for leghold traps set for beaver (Bogges and Loegering, Bromley et al. 1994, Dolbeer et al. 1994, Howard et al. 1980, Miller and Yarrow 1994, Randolph 1988). In some situations drowning trap sets are the most appropriate and efficient method available to capture beaver. For example, a drowning set attachment should be used with leghold traps when capturing beaver to prevent the animal from injuring themselves while restrained, or from escaping (Miller and Yarrow 1994). Animals that drown die relatively quickly (e.g., within minutes) versus the possible stress of being restrained and harassed by people, dogs, and other wildlife before being euthanized. Drowning sets make the captured animal and trap less visible and prevent human injury (i.e., bites and scratches) to people who may otherwise approach a restrained animal. Furthermore, some people are offended seeing

dead animals and drowning takes the dead animal out of public view. Some sites may be unsuitable for body-gripping traps or snares because of unstable banks, deep water, or a marsh with muck bottom, but these sites would be suitable for leghold traps.

Given the short time period of a drowning event, the possible analgesic effect of CO₂ buildup to the beaver, the minimum if any pain or distress on drowning animals, the AVMA's acceptance of hypoxemia as euthanasia and the AVMA's acceptance of a minimum of pain and distress during euthanasia, we conclude that drowning, though rarely used by WS, is acceptable. Furthermore, this method of placing traps for beaver damage management is authorized by the IDNR for nuisance wildlife control (17 IL Administrative Code Activities Part 525). Regardless of these facts, we recognize some people will disagree and are unswayed.

2.2.5 Impacts to stakeholders, including aesthetics.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception and today a large percentage of households have pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

There is some concern that the proposed action or the Alternatives would result in the loss of aesthetic benefits to the public, resource owners or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987) and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing) and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences, such as looking at photographs and films of wildlife, reading about wildlife, or benefitting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms; bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

IWDM provides relief from damage or threats to public health or safety to people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by problems and threats to public health or safety caused by beaver insist

upon their removal from the property or public location when they cause damage. Some people have an idealistic view and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to public health or safety. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to beaver damage management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment. The ability to view and aesthetically enjoy beavers at a particular site could be limited if the beavers are removed. New beavers, however, would likely use the site in the future, although the length of time until new animals arrive is variable, depending on the habitat, time of year, and population densities in the area. The opportunity to view beavers is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

Illinois WS only conducts beaver damage management at the request of the affected home/property owner or resource manager. If WS received requests from an individual or official for beaver damage management, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.3 ADDITIONAL ISSUES USED TO DEVELOP MITIGATION MEASURES

2.3.1 Cultural Resources Concerns

The National Historic Preservation Act of 1966, as amended, requires federal agencies to evaluate the effects of any federal undertaking on cultural resources and to consult with appropriate American Indian Tribes to determine whether they have concerns for cultural properties in areas of these federal undertakings. The Native American Graves and Repatriation Act of 1990 provides for protection of American Indian burial sites, human remains, funerary objects and sacred objects, and establishes procedures for notifying Tribes of any new discoveries.

In most cases, beaver damage management has little potential to cause adverse effects to sensitive cultural resources. The areas where damage management would be conducted are small and pose minimal ground disturbance. The Illinois Historic Preservation Agency will be provided this Pre-Decisional document for determination if the proposed beaver damage management program is likely to cause effects on historic properties. In consideration of American Indian cultural and archeological interests, the Illinois WS program will also provide a Notice of Availability of this EA to all the tribes in Illinois.

2.3.2 Environmental Justice and Executive Order 12898 - *“Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”*

Environmental Justice (EJ) has been defined as the pursuit of equal justice protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Fair treatment implies that no person or group should endure a

disproportionate share of the negative environmental impacts resulting from this country's domestic and foreign policies or programs.

Executive Order 12898 requires federal agencies to make EJ part of their mission and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minority and low-income persons or populations. APHIS plans to implement Executive Order 12898 principally through the provisions of NEPA.

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, WS beaver damage management may provide for a safer environment for minority or low-income persons by reducing public health and safety risks.

2.3.3 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045).

Children may suffer disproportionately from environmental health and safety risks for many reasons, including their development physical and mental status. WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and has considered the impacts that this proposal might have on children. The proposed beaver damage management would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action. In contrast, WS beaver damage management may provide for a safer environment for children by reducing public health and safety risks.

2.4 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.4.1 WS' Impact on Biodiversity.

Beaver damage management is not conducted to eradicate a native wildlife population. WS operates according to international, federal and State laws and regulations enacted to ensure species viability. In addition, any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. The impacts of the current WS program on biodiversity are minor and not significant nationwide, statewide, or region-wide (USDA 1997). WS operates on a small percentage of the land area of the State for beaver management (i.e., less than 1,000 acres or 0.002% of the State) and the WS take of beaver is a small proportion, relative to the permitted take, including regular fur harvest and Nuisance Animal Removal Permits, (less than 0.2%), of the total population and is insignificant to the viability and health of the population (see Section 4.3).

2.4.2 Possible effects on wetlands from removing beaver dams

There may be some concern that the removal or breaching of beaver dams from an area will result in the loss of wetlands.

Beaver dams are constructed from natural materials, such as logs, sticks, leaves and mud, that beaver gather from the surrounding area. When beaver dams are removed to reduce flood waters and maintain existing stream channels and drainage patterns, these materials are dislodged and returned to the surrounding area. Beaver dam removal events conducted by WS either manually or using explosives are virtually identical to natural phenomena that commonly occur during heavy rains. During these natural events, large quantities of water flow through beaver impoundments and frequently the dams are washed out and the dam material is returned to the surrounding area. Beaver dam breaching by hand or with binary explosives does not affect the substrate or the natural course of the stream but merely returns the area to its preexisting condition with similar flows and circulations. Therefore, WS removal and breaching of beaver dams should have no adverse effects on wetlands. Criteria for the removal and breaching of beaver dams by Illinois WS is described in Appendix C.

2.4.3 Beaver damage should be managed by trappers and nuisance wildlife control agents.

The jurisdiction for managing most resident wildlife rests with the IDNR. Currently, IDNR manages beaver as furbearers. Historically, the IDNR, through season and bag limit regulation and trapping method restrictions, has used private fur trapping as the main tool in beaver population management in Illinois.

Private fur trappers provide a societal service by trapping beaver that are causing damage to public and private property. However, the number of private fur trappers has declined in recent years. According to data from the IDNR, the total number of animal pelts sold during the 1999-00 season decreased by 52% from 1998-99 figures. During this same year, the value of pelts sold by the furtakers decreased by 54%. On the other hand, beaver pelt prices showed a 5% increase in value and a 26.5% increase in harvest during the same years, approaching the long-term harvest average since 1975. This shows a strong correlation between the price of fur pelts and trapping activity by the general public (IDNR 2000).

Although private fur trappers may remove many damage causing beaver during the open beaver season (early November-late March), many beaver problems occur outside the normal beaver season. Many beaver damage problems also occur in urban or developed areas where little or no private beaver trapping occurs. Additionally, we have seen that fur trapping effort is closely correlated to the current market value of the pelts. As pelt prices rise and fall, trapping efforts by the general public change accordingly. In general, when prices are low, as the market has seen over the past several years, trapping effort is not sufficient to alleviate damage caused by beaver.

In response to property damage, trappers and landowners are also allowed to conduct beaver removal under a Nuisance Animal Removal Permit from the IDNR outside the open trapping season. Private fur trappers may not be willing to trap beaver outside the regular beaver season, because pelts taken during this period cannot be sold. Most private trappers cannot afford to provide year-around, site-specific beaver damage management services. However, that option remains open to landowners/managers experiencing damage.

Site-specific damage management has been necessary to protect property, roads, bridges, and agricultural and natural resources. It is the policy of WS to provide professional damage management upon request following verification of damage at site-specific locations. Typically,

damage management involves removing a small number of beaver and/or dams from a localized area. WS is not involved in statewide or large-scale beaver population reductions. Only beaver populations found near damage sites are targeted.

Some landowners may prefer that a government agency trap beaver instead of using private trappers or nuisance wildlife control agents. Some landowners with numerous damage sites may prefer to use WS because of reduced administrative burden. Some landowners may prefer to use private trappers or nuisance wildlife control agents instead of WS. Therefore, WS beaver damage management activities would not eliminate opportunities for private trappers or nuisance wildlife control agents.

2.4.4 Beaver causing damage should be relocated.

Relocation of problem wildlife species is a technique that is sometimes used to alleviate wildlife damage problems. The success of a relocation effort, however, depends on the potential for the problem individuals to be captured efficiently and the existence of an appropriate relocation site (Nielsen 1988). While relocation may be appropriate in some situations when the species population is low, beaver are relatively abundant in much of the suitable habitat in Illinois and relocation is not necessary for the maintenance of viable populations. Because beavers are relatively abundant in Illinois, beavers relocated into suitable habitat are very likely to encounter other beavers with established territories. Beavers are highly territorial and the newly introduced beavers, which are disoriented and at a disadvantage, are often viciously attacked and sometimes killed from these encounters (McNeely 1995).

Relocated beavers may also disperse long distances from the release site (Novak 1987). Hibbard (1958) in North Dakota recorded an average dispersal distance by 17 relocated beavers to be about 9 miles and Denney (1952) in Colorado reported an average dispersal of 10.4 miles and a maximum dispersal of 30 miles for 26 transplanted beavers. Beavers relocated on streams and later recaptured (N=200) moved an average distance of 4.6 miles, and in lake and pothole relocations (N=272) moved an average of 2 miles (Knudsen and Hale 1965). Only 12% of beavers relocated on streams and 33% of beavers relocated in the lake and pothole areas remained at the release site (Knudsen and Hale 1965).

The relocation of beavers that are causing damage could result in damage problems at the release site or dispersal site. In this case, the original damage problem has simply been shifted from one property to another. If WS relocated the problem animal, WS may be held liable for any subsequent damage caused by that animal.

Live-trapping and relocating beavers is not cost-efficient and is biologically unsound (Wade and Ramsey 1986). The AVMA, the National Association of State Public Health Veterinarians and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission, particularly for small mammals (Center for Disease Control 1990). Additionally, the survival of relocated animals is generally very poor due to the stress of relocation (Craven 1992). Courcelles and Nault (1983) found that 50% (N=10) of radio-collared, relocated beavers died, assumably from stress-related causes, including vulnerability to predation, resulting from the relocation. Among animal advocacy groups, there appears to be disagreement about relocating wildlife to alleviate damage. The People for the Ethical Treatment of Animals

opposes relocation of problem beavers because they believe relocation is cruel (Redmon 1999, 2000). The Humane Society of the United States believes relocation is preferable to death in some circumstances, but relocation could be stressful and result in suffering or death (Bridgeland et al. 1997).

Despite the concerns raised in this section with the relocation of beaver, WS will consider this option on a case-by-case basis. The decision whether to relocate beaver captured will be made in conjunction with biologists the IDNR. Beaver relocations will be made only from areas requested by the IDNR to areas identified by the IDNR.

2.4.5 Live-capture and euthanasia only.

Live-capture and euthanasia of beavers may be used as part of the IWDM approach to reduce beaver damage. Snares or Hancock™-type traps would be used to live-capture beavers. While snares and Hancock™ traps are an effective and, at times, an efficient tool for capturing beavers, the use of additional methods (e.g., body- grip traps, shooting, leg-hold traps) could be necessary to reduce damage in a cost-effective manner.

2.4.6 Breaching of dams or use of water control structures without beaver removal.

This issue addresses attempts to alleviate flooding damage by controlling the water level at the site without removing the beaver. Dams would either be breached manually or with binary explosives, but these methods are usually ineffective because beavers will quickly repair or replace the dam (McNeely 1995). Installing and maintaining water control structures or removing beaver dams on a daily or weekly basis may be cost prohibitive and would not alleviate damage from gnawing or felling of trees.

Water control devices and pond levelers have been used for many years in many States, with varying degrees of success. Various types of beaver pond levelers have been described (Arner 1964, Laramie and Knowles 1985, Lisle 1996, Roblee 1984) and installation of beaver pond levelers can be effective in reducing flooding in certain situations (Miller and Yarrow 1994, Organ et al. 1996), but pond levelers are not suitable for all applications. For example, in New York pond levelers could only be used at 3% of damage sites and required continued maintenance to be effective (Jensen 1999). Even when installed and maintained properly, beaver can build dams below the leveler and raise the water back over the leveler to original damage levels. The Clemson beaver pond leveler works best at road culverts, beaver dams on small streams and water level control structures. The leveler is unsuited for situations when the normal water flow exceeds the capacity of one or more levelers, in large watersheds, where multiple beaver dams exist and the drop in elevation is slight, where water surges violently, or where moving ice in the spring will damage the intake device. Likewise, a leveler may not work where there are extensive drainage ditch systems and large agricultural fields. Installation and maintenance of the levelers may be cost prohibitive at some sites. First year installation and maintenance costs were found to be \$1,542 per site in New York.

The Beaver Deceiver is a relatively recent water control system that attempts to quiet, calm and deepen the water around culverts, in theory reducing their attractiveness to beaver and excluding beaver from a wide area around the upstream opening of the culvert (Lisle 1996). However, the

effectiveness of this method is theoretical and has not been evaluated. Recreational fur trapping is an integral part of and justification for using beaver deceivers. Fur trapping keeps beaver populations at acceptable levels by minimizing flooding and road damage (Lisle 1996). Preservation of the fur resource for recreational trapping is the benefit of using beaver deceivers (Lisle 1996).

WS could implement the use of water control devices as part of an integrated beaver management program at appropriate sites. The Maine WS program installed over 160 water control devices in 1998. The primary benefit of the use of these devices in Maine is to minimize flooding damage while leaving beavers for fur trappers to remove during the regulated trapping season each year (E. Butler, USDA/APHIS/WS, pers. comm.). In Mississippi, the WS program commonly installs water control devices at sites where the landowner intends to hunt ducks or lease duck hunting rights on his land (B. Sloan, USDA/APHIS/WS, pers. comm.). Because there are few fur trappers in Mississippi, it is generally necessary to suppress local beaver populations annually at the site to maintain the effectiveness of the device (B. Sloan, USDA/APHIS/WS, pers. comm.). Therefore, in both Maine and Mississippi, the use of water control devices is supplemented by the local population beaver management. An added benefit of maintaining the pond level is received (i.e., reserving beaver for the fur harvest and providing duck hunting sites) which helps to justify the expense of leveler installation and maintenance.

2.4.7 Appropriateness of preparing an EA, instead of an EIS, for such a large area.

There may some concern as to whether preparing an EA for an area as large as the State of Illinois would meet the NEPA requirements for site specificity. If in fact, a determination is made through this EA that the proposed action would have a significant environmental impact, then an Environmental Impact Statement (EIS) would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones. Additionally, WS anticipates to conduct beaver damage management in a very small percentage of the State, where damage is occurring or likely to occur (see Section 1.3) and damage may occur anywhere in the State (see Section 1.9.5).

2.4.8 Effects on regulated beaver harvest.

There may be some concern that WS' beaver removal activities may negatively effect their opportunity to harvest beaver throughout the State. Individuals may be concerned that WS would impact their opportunities to harvest beaver during the State-regulated trapping season.

WS removal activities would not likely affect the beaver harvest in the State since the overall number of beavers removed by WS is insignificant to the State-wide beaver fur harvest by private trappers or those taken under IDNR Nuisance Animal Removal Permits. WS conducts beaver removal activities only in areas where a request was made by the property owner or manager and where damage is occurring. These property owners and managers are not required to use the services that are available from WS and may choose to use private trappers to conduct beaver removal activities if they so desire. In some situations, such as when damage is minor and the fur season is open, WS recommends the use of private fur trappers to remove beaver.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of seven parts: 1) an introduction; 2) description of Alternatives considered and analyzed in detail including the Proposed Action; 3) beaver damage management approaches used by WS; 4) beaver damage methods authorized for use or recommended; 5) methodologies recommended but deemed impractical, ineffective or unsafe at the present time; 6) a description of Alternatives considered, but eliminated from detailed analysis; and 7) a table of mitigation measures and SOP's. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), "*Methods of Control*" (USDA 1997 Appendix J) and the "*Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program*" (USDA 1997, Appendix P) of USDA (1997). Five Alternatives were recognized, developed and analyzed in detail. Four additional Alternatives were considered but not analyzed in detail with supporting rationale.

The five alternatives analyzed in detail are:

- Alternative 1 - No WS Beaver Damage Management in Illinois. This Alternative would result in no assistance from WS in reducing beaver damage in Illinois. WS would not provide technical assistance or operational damage management services.
- Alternative 2 - Only Lethal Beaver Damage Management. Under this Alternative, only lethal operational damage management and technical assistance would be provided by WS.
- Alternative 3 - Integrated Beaver Damage Management for all public and private land (No Action/Proposed Action). This Alternative is the current IL WS beaver damage management program and is the proposed action. Under this Alternative lethal and non-lethal operational damage management and technical assistance would be provided by WS.
- Alternative 4 - Technical Assistance Only. Under this Alternative, WS would not conduct operational beaver damage management in Illinois.
- Alternative 5 - Non-lethal Beaver Damage Management. Under this Alternative, only non-lethal operational damage management and technical assistance would be provided by WS.

3.1 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

3.1.1 Alternative 1. No WS Beaver Damage Management in Illinois.

This Alternative would result in no assistance from WS in reducing beaver damage in Illinois. WS would not provide technical assistance or operational damage management services. All requests for beaver damage management would be referred to the IDNR, local animal control agencies or private individuals, businesses or organizations. Assistance may or may not be available from any of these entities.

3.1.2 Alternative 2. Only Lethal Beaver Damage Management

Under this Alternative, only lethal operational beaver damage management and technical assistance would be provided by WS. Requests for information regarding non-lethal management approaches would be referred to IDNR, local animal control agencies or private businesses or organizations. Individuals or agencies might choose to implement WS lethal recommendations, non-lethal methods

or other methods not recommended by WS, contract for WS lethal damage management services, use contractual services of private businesses, use volunteer services or take no action.

3.1.3 Alternative 3. Integrated Beaver Damage Management for all Private and Public Land (No Action and Proposed Action).

Wildlife Services proposes to administer and continue the current beaver damage management program in the State of Illinois. An IWDM approach would be implemented to reduce damage associated with beaver activities to property, agricultural and natural resources and public health and safety on all lands in Illinois where a need exists and a request is received. Damage management would be conducted on property in Illinois when the property owners or managers request assistance to alleviate beaver damage. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, target and nontarget species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. In other situations, beaver would be removed as humanely as possible using body-grip (e.g., Conibear-type) traps, snares, leghold traps and shooting. When appropriate and necessary, beaver dams would be breached using binary explosives or by hand. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, State and local laws.

3.1.4 Alternative 4. Technical Assistance Only.

This Alternative would only allow Illinois WS to provide technical assistance to individuals or agencies requesting beaver damage management in Illinois. Property owners and land managers could be implement their own beaver damage management program, use contractual services of private businesses, use volunteer services or take no action. This Alternative would place the immediate burden of operational damage management work on the property owners/managers. Individuals experiencing beaver damage would, independently or with Illinois WS recommendations, carry out damage management activities.

3.1.5 Alternative 5. Non-lethal Beaver Damage Management.

Under this Alternative, only non-lethal management approaches would be used or recommended by WS. Both non-lethal operational damage management services and technical assistance would be provided by WS. Requests for information regarding lethal management approaches would be referred to IDNR, local animal control agencies or private businesses or organizations. Individuals or agencies might choose to implement WS non-lethal recommendations, implement lethal methods

or other methods not recommended by WS, contract for WS non-lethal damage management services, use contractual services of private businesses, use volunteer services, or take no action.

3.2 BEAVER DAMAGE MANAGEMENT APPROACHES USED BY WS.

Wildlife damage management is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife (USDA 1997). The wildlife damage management approaches used by WS are described below.

3.2.1 Integrated Wildlife Damage Management

During more than 80 years of resolving wildlife damage problems, WS has considered, developed and used numerous methods of reducing damage problems (USDA 1997). WS' efforts have involved the research and development of new methods, and the implementation of effective strategies to resolve and prevent wildlife damage.

The most effective approach to resolving wildlife damage is usually to integrate the use of several methods simultaneously or sequentially. IWDM is the implementation and application of safe and practical methods for the prevention and reduction of damage caused by wildlife based on local problem analyses and the informed judgement of trained personnel. The WS Program applies IWDM, commonly known as Integrated Pest Management (WS Directive 2.105), to reduce damage through the WS Decision Model (Slate et al. 1992) discussed in Section 3.2.3.

The philosophy behind IWDM is to implement effective management techniques in a cost-effective manner while minimizing the potentially harmful effects to humans, target and non-target species and the environment. IWDM draws from the largest possible array of options to create a combination of techniques for the specific situations. IWDM may incorporate cultural practices, habitat modification, animal behavior modification, removal of individual animals, local population reduction or any combination of these, depending on the characteristics of the specific damage problems.

3.2.2 Integrated beaver damage management strategies used by WS.

3.2.2.1 Technical Assistance: Under this strategy, WS personnel provide information, instructional and educational sessions, demonstrations and advice on available beaver damage management techniques. Technical assistance includes demonstrations on the proper use of damage reduction devices (body-grip traps, leg-hold traps, tree-wraps, etc.) and information on water-level control devices, wildlife habits and biology, habitat management, and animal behavior modification. Technical assistance is generally provided following an on-site visit or verbal consultation with the requester. Bulletins and leaflets on beaver biology could be sent to requesters to inform them about aesthetic values of beaver, types of damage and damage management methods. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on factors such as need and practical application. WS considers the biology and behavior of the damaging species, and other factors using the WS Decision Model (Slate et al. 1992). Technical assistance may require substantial effort by WS personnel in the decision making process, but the

management decision and the actual damage reduction work is the responsibility of the requester.

Education is an important element of WS' program activities because wildlife damage management is about finding "balance" or co-existence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to farmers, homeowners and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals and the public are updated on recent developments in damage management technology, laws and regulations and agency policies.

3.2.2.2 Operational Damage Management Assistance: Operational damage management assistance is implemented by WS when the problem cannot be resolved through technical assistance and when WS operational management assistance is requested and appropriate. The initial investigation explores and defines the nature and history of the problem, extent of damage and the species responsible for the damage. Professional skills of WS personnel are often required to resolve problems effectively and safely, especially if restricted pesticides are required or if the problem requires the direct supervision of a wildlife professional. WS considers the biology and behavior of the damaging species and other factors using the WS Decision Model (Slate et al. 1992).

3.2.3 WS Decision Making

The procedures used by WS personnel to determine management strategies or methods applied to specific damage problems can be found in USDA 1997, Appendix N.

The WS Decision Model (Figure 3-1) considers the following factors before selecting or recommending damage management methods and techniques:

- Species responsible for the damage;
- Magnitude, geographic extent, frequency, historical damage and duration of the problem;
- Status of target and non-target species, including T&E species;
- Local environmental conditions;
- Potential biological, physical, economic and social impacts;
- Potential legal restrictions; and
- Costs of damage management option.

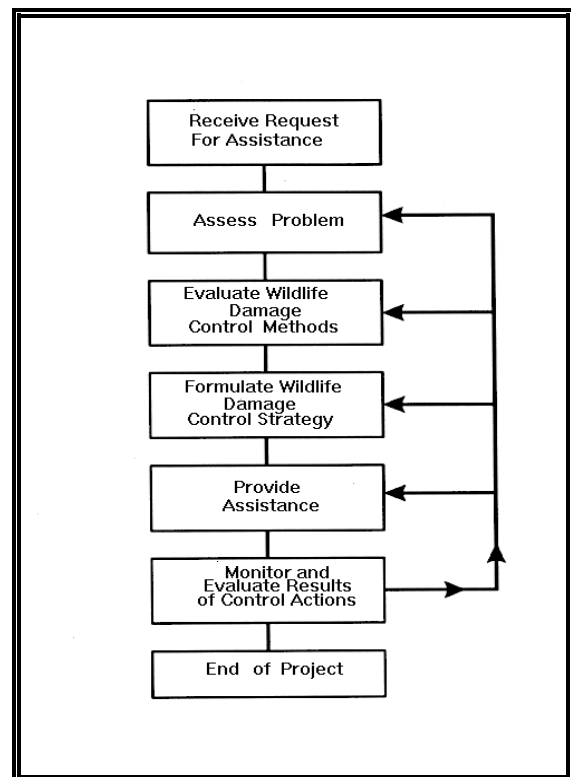


Figure 3-1. WS Decision Model.

The decision making process is a procedure for evaluating and responding to damage complaints. WS personnel are frequently contacted after requesters have tried non-lethal techniques and found them to be inadequate for reducing damage to an acceptable level. Personnel assess the problem, methods are evaluated for their availability (legal and administrative) and suitability based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situations are formed into a management strategy. After the management strategy has been implemented, monitoring and evaluation of the strategy is conducted to assess the effectiveness of the strategy. If the strategy is effective, the present need for management is ended.

When damage continues intermittently over time, WS personnel and the requester monitor and reevaluate the situation. If one method or a combination of methods fail to stop damage, a different strategy is implemented. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results, with the damage management strategy reevaluated and revised periodically if necessary.

3.2.4 Local Decision Making Process

The WS program in Illinois follows the “Co-managerial approach” to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of beaver and effective, practical and reasonable methods available to the local decision maker(s) to reduce wildlife damage. This includes non-lethal and lethal methods. Technical assistance on alleviating damage caused by beavers is also available from IDNR. WS and the IDNR may facilitate discussions at local community meetings and make recommendations. Resource owners and others directly affected by beaver damage or conflicts in Illinois have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations. Local decision makers have the final decision on which available (legally and administratively) methods would be used to resolve the beaver-related conflict. They may also compare the benefits versus the damage when deciding which methods would be implemented. Local decision makers must also weigh the cost of implementing each methodology or a series of methodologies. These decision makers include community leaders, private property owners/managers and public property owners/managers.

3.3 BEAVER DAMAGE MANAGEMENT METHODS AUTHORIZED FOR USE OR RECOMMENDED BY WS

USDA (1997 Appendix J) describes methods currently used by the WS program. Several of these were considered in this assessment because of their potential use in reducing beaver damage to roads and railroads, property, natural and agricultural resources, and public health and safety.

3.3.1 Non-lethal Beaver Damage Management Methods.

Habitat management generally refers to riparian vegetation manipulation to reduce the carrying capacity for beaver. This would involve the removal of all woody and aquatic vegetation to

eliminate beaver food resources. However, this would be an extreme and impractical method in most situations. Habitat management may also involve manipulating beaver impoundment water levels to reduce damage or conflict caused by flooding. Water-level control devices are installed to regulate the volume of water and can be effective in reducing flooding in certain situations. Water-level control devices are also utilized as a means of exclusion at road culverts.

Exclusion (e.g., tree wraps, fencing, grit paint) involves preventing beaver from gaining access to a resource to be protected (i.e., trees, crops).

Beaver dam breaching involves the removal of debris deposited by beaver that impedes the flow of water. This debris would be removed either with the use of binary explosives, mechanically or by hand.

3.3.2 Lethal Damage Management Methods.

These methods involve damage management specifically designed to lethally remove beavers in certain situations to a level that stabilizes, reduces or eliminates damage. The amount of removal necessary to achieve a reduction of beaver damage varies according to the resource protected, habitat, species population, the effectiveness of other damage management strategies and other population factors.

Shooting is selective for the target species and may involve the use of spotlights and firearms.

Body-grip (e.g., Conibear) traps are designed to cause the quick death of the animal that activates the trap. The appropriate size trap would be used for beavers (generally Conibear 330) and are used in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface.

Leghold traps can be effectively used to capture a variety of mammals. Although beaver could be live-captured by this method, all beavers would be euthanized. Effective trap placement and adjustment and the selection and the placement of appropriate lures by trained WS personnel contribute to the selectivity of the leghold trap.

Snares are live-capture devices, consisting of a cable loop and a locking device and are placed in travel ways. Most snares are also equipped with a swivel to minimize cable twisting and breakage. Beavers live-captured in snares would be euthanized or could be relocated.

Hancock traps (i.e., suitcase/basket-type cage traps) are designed to live-capture beavers. The trap is constructed of a metal frame that is hinged with springs attached and covered with chain-link fence. The appearance of this trap is similar to a large clam when closed. When set, the trap is opened to allow an animal to enter the *clam shells*. When tripped, the *clam shells* close around the animal. Beavers captured by this method would be euthanized or could be relocated.

3.3.3 Other Methods Considered but are Ineffective or Impractical.

Harassment activities have generally been proven ineffective in reducing beaver damage problems (Jackson and Decker 1993). Use of mechanical harassment techniques (i.e., propane exploders)

have been used successfully for short periods of time in specific areas.

Repellents are not available for beaver damage management as none have been registered for this purpose. However, recent research from the USDA, APHIS, WS, National Wildlife Research Center has suggested that painting trees with a mixture of 1 quart of sand to 1 gallon of exterior latex paint may prevent beaver from gnawing and cutting the painted trees. If this method is found to be effective and practical, and if it is classified as a “repellent” requiring registration under the FIFRA and State pesticide control laws, then WS would consider using/recommending this repellent method once registered.

Toxicants are not available for beaver damage management as none have been registered for this purpose.

3.4 ALTERNATIVES CONSIDERED BUT NOT IN DETAIL, WITH RATIONALE

3.4.1 Eradication and Suppression

An eradication and suppression Alternative would direct all Illinois WS beaver damage management efforts toward planned, total elimination or suppression of this species.

Eradication of beaver in Illinois is not supported by Illinois WS or IDNR. This Alternative was not considered in detail because:

- Illinois WS opposes eradication of any native wildlife species;
- IDNR opposes eradication of any native Illinois wildlife species;
- The eradication of a native species would not be possible to accomplish; and
- Eradication of native species is not acceptable to most members of the public.

Suppression would direct Illinois WS program efforts toward managed reduction of certain problem wildlife populations or groups. To consider large-scale population suppression as a goal of the Illinois WS program is not realistic, practical or allowable under present WS policy.

3.4.2 Population Stabilization Through Birth Control.

Contraceptives for mammals can be grouped into four categories; surgical sterilization, oral contraception, hormone implantation, and immuno-contraception (the use of contraceptive vaccines). These techniques would require that beaver to receive either single, multiple or possibly daily treatment to successfully prevent conception. The use of this method would be subject to approval by federal and State agencies.

Chemical sterilants can be classified into one of three types; chemosterilants, immunocontraceptives and temporary or short term contraceptives. Chemosterilants have been suggested as a means to managing beaver populations (Davis 1961, Arner 1964). Several reproductive inhibitors have been proposed for use in beaver population reduction, including quinestron (17-alpha-ethynyl-estradiol - 3-cyclopentylether) and mestranol (Gordon and Arner 1976, Wesley 1978). While chemosterilants have been shown to reduce beaver reproduction in controlled experiments, there are no practical, effective methods for distributing chemosterilants in

a consistent way to wild, free ranging beaver populations (Hill et al. 1977, Wesley 1978). A review of research evaluating chemically induced and surgically induced reproductive inhibition as a method for controlling nuisance beaver populations is contained in Novak (1987). Although these methods were effective in reducing beaver reproduction by up to 50%, the methods were not practical or were too expensive for large-scale application.

This Alternative was not considered in detail because: (1) it would take a number of years of implementation before the beaver population would decline, therefore, damage would continue at the present unacceptable levels for a number of years; (2) surgical sterilization would have to be conducted by licensed veterinarians, therefore, it would be extremely expensive; (3) it is difficult to effectively live trap or chemically capture the number of beaver that would need to be sterilized in order to effect an eventual decline in the population; and (4) no chemical or biological agents for contracepting beaver have been approved for use by State and federal regulatory authorities.

As with chemical repellents and toxicants, a reproduction inhibitor could potentially affect non-target wildlife and the environment. Any material would have to be intensively tested and approved for use. Inhibition of reproduction may also affect behavior, physiological mechanisms, and colony integrity (Brooks et al. 1980). Additional research is needed before the environmental affects, and affects to populations and individual animals, from reproductive inhibitors are known. Should a technique or chemical become registered for use, it could be incorporated into the IWDM Program in Illinois.

3.4.3 Compensation for Wildlife Damage Losses

The compensation Alternative would direct all Illinois WS program efforts and resources toward the verification of losses from beaver and to providing monetary compensation for these losses. Illinois WS activities would not include any operational damage management or technical assistance.

This option is not currently available to Illinois WS because WS is directed and authorized by law to protect American agricultural and natural resources, property and public health and safety (Animal Damage Control Act of 1931, as amended; and the Rural Development, Agricultural and Related Agencies Appropriation Act of 1988). Analysis of this Alternative in USDA (1997) shows that it has many drawbacks, including:

- Compensation would not be practical for public health and safety problems;
- It would require larger expenditures of money to investigate and validate all losses and to determine and administer appropriate compensation;
- Timely responses to all requests to assess and confirm losses would be difficult and many losses could not be verified;
- Compensation would give little incentive to limit losses through other management strategies;
- Not all resource managers/owners would rely completely on a compensation program and unregulated lethal control would probably continue and escalate; and
- Neither Congress nor the State of Illinois have appropriated funds for a beaver damage compensation program.

3.4.4 Bounties

There are no statewide bounties on beaver in the State of Illinois. Payments distributed for killing beaver (bounties) suspected of causing economic losses is neither supported by WS nor does Illinois WS have the authority to establish a bounty program. Bounties are not considered further because:

- Bounties are generally not effective in reducing damage;
- Circumstances surrounding take of animals is largely unregulated; and
- No process exists to prohibit taking of animals from outside the damage management area for compensation purposes.

3.5 MITIGATION AND STANDARD OPERATING PROCEDURES (SOP's) FOR BEAVER DAMAGE MANAGEMENT

Mitigation is any feature of an action that serves to prevent, reduce or compensate for impacts that might otherwise result from that action. The current WS program, nationwide and in Illinois, uses many such mitigations and these are discussed in detail in Chapter 5 of USDA (1997). Mitigations used by Illinois WS and are incorporated into Alternatives 2, 3, 4, and 5 are provided in Table 3-1.

Table 3-1. Mitigation Measures.

MITIGATION MEASURES	ALTERNATIVES				
	1	2	3	4	5
<i>Animal Welfare and Humaneness of Methods Used by WS</i>					
Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate.		X	X	X	X
The Decision Model would be used to identify effective biologically and ecologically sound beaver damage management strategies and their impacts.		X	X	X	X
Captured non-target animals would be released unless it is determined by the Illinois WS personnel that the animal would not survive.		X	X		X
The use of traps and snares would conform to current laws and regulations administered by IDNR and Illinois WS policy.		X	X		X
Where practical, euthanasia procedures approved by the AVMA that cause minimal pain would be used for live animals.		X	X		
The use of newly-developed, proven, non-lethal methods would be encouraged when appropriate.			X	X	X
<i>Safety Concerns Regarding WS' Beaver Damage Management Methods</i>					
The Decision Model, designed to identify the most appropriate damage management strategies and their impacts, would be used to determine beaver damage management strategies.		X	X	X	X
Beaver damage management conducted on public lands would be coordinated with the management agency.		X	X		X
Live traps would be placed so that captured animals would not be readily visible from any road or public area.		X	X		X
<i>Concerns about Impacts of Beaver Damage Management on T&E Species, Species of Special Concern, and Non-target Species.</i>					
WS consulted with the USFWS regarding the nation-wide program and would continue to implement all applicable measures identified by the USFWS to ensure protection of T&E species.		X	X		X
Illinois WS' take would be considered with the statewide "Total Harvest" (Illinois WS take and fur harvest) when estimating the impact on wildlife species.		X	X		
Management actions directed toward localized populations or groups and or individual offending animals, dependent on the extent of the problem.		X	X		X
WS personnel would be trained and experienced to select the most appropriate method for taking targeted animals and excluding non-target species.		X	X		X
WS would initiate informal consultation with the USFWS following any incidental take of T&E species.		X	X		X

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information for making informed decisions on the beaver damage management program outlined in Chapter 1 and the issues and affected environment discussed in Chapter 2. This chapter consists of: 1) analysis of environmental consequences; 2) analysis of each Alternative against the issues considered in detail; and 3) summary of WS' impacts.

4.1 ENVIRONMENTAL CONSEQUENCES

This section analyzes the environmental consequences using Alternative 3 (the current program) as the no action Alternative and therefore will be used as the baseline when comparing the other Alternatives to determine if the real or potential impacts are greater, lesser or the same (Table 4-4). The No Action Alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable Alternative that could be selected and serves as a baseline for comparison with the other Alternatives. The No Action Alternative, as defined here, is consistent with the Council on Environmental Quality (CEQ) (1981).

The following resource values within Illinois would not be adversely impacted by any of the Alternatives analyzed; soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber and range. These resources will not be analyzed further.

4.1.1 Social and Recreational Concerns

Social and recreational concerns are discussed throughout the document as they relate to issues raised during public involvement, and they are discussed in USDA (1997).

4.1.2 Cumulative and Unavoidable Impacts

Cumulative and unavoidable impacts are discussed in relationship to each of the wildlife species and the environmental impacts are analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Analysis of the Illinois WS "takes" during 1997, 1998, 1999 and 2000, and anticipated future WS take, in combination with other mortality, indicates that cumulative impacts are not adversely affecting the viability and health of populations. It is not anticipated that the WS program would result in any adverse cumulative impacts to T&E species and beaver damage management activities do not jeopardize public health and safety.

4.1.3 Irreversible and Irretrievable Commitments of Resources

Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the Illinois WS program produces very negligible impacts on the supply of fossil fuels and electrical energy.

4.2 ISSUES ANALYZED IN DETAIL

This section presents the expected consequences of each Alternative on each of the issues analyzed in detail.

4.2.1 Alternative 1: No WS Beaver Damage Management in Illinois

Effects on beaver. Some resource owners experiencing damage would trap beaver, or hire private trappers, during the legal harvest season, or obtain permits from the IDNR to trap or shoot beaver outside of the regular trapping season, but would receive no guidance from WS regarding these options. Beaver populations could continue to increase where trapping and shooting pressure was low and would decline or stabilize where trapping and shooting pressure was adequate. Other resource owners experiencing damage may take illegal or unsafe action against local populations of beaver out of frustration of continued damage resulting in unknown impacts to beaver populations. Overall impacts on statewide beaver populations would be similar to Alternative 3, since affected resource owners would likely lethally remove the damaging beaver that would no longer be removed by WS.

Effects on plants and other wildlife species, including T&E species. In the absence of WS assistance, some resource owners may attempt to trap beaver or hire private trappers with little or no trapping experience. These resource owners or trappers would be more likely than WS personnel to trap and not report non-target take to regulatory authorities. Other resource owners experiencing damage may take illegal or unsafe action against local populations of beaver out of frustration of continued damage resulting in unknown impacts to plant and wildlife populations.

One anticipated outcome of no WS beaver damage management program, is that it is likely that there would be a minor increase in beaver damage and the associated beaver created impoundments if resource owners did not remove beaver dams. These impoundments would likely have an impact on other wildlife and plant species. The extent and nature of the impacts would depend upon the size of the beaver created impoundment and the diversity of plant and animal species in the area. Some species would flourish in the newly created environment, while others would diminish. The positive effects of beaver activities, including affected species, have been summarized in Section 1.3.1. The negative affects of increased beaver impoundments, including affected species, are described in Sections 1.3.2 and 1.3.3.

Effects on public and pet health and safety. If resource owners did not implement an effective beaver damage management program in the absence of WS, there is the potential for increased risks to public health and safety from unresolved damage situations. For example, burrowing into or flooding of roadways and railroad beds can result in serious accidents (Woodward 1983, Miller and Yarrow 1994). Beavers are also carriers of the intestinal parasite *Giardia lamblia*, which can contaminate water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). Additionally, resource owners inexperienced in the safe and proper use of management tools may attempt to resolve beaver damage problems. Without professional assistance or proper training in the use of beaver damage management tools, there is the potential for increased risks to public and pet safety. These increased risks are associated with the improper or inexperienced use of damage management methods such as trapping, shooting, and dam removal with explosives.

Humaneness of methods to be used. This Alternative would be considered humane by people that do not believe that WS should use lethal control methods. However, property owners/managers could use lethal and non-lethal methods to reduce beaver damage in the absence of WS, with impacts on humaneness dependent upon the experience of the person implementing the control method. Some animal rights activists may perceive this method as inhumane because they oppose all lethal methods of damage management. Some property owners/managers may take illegal action against localized populations of beaver out of frustration of continued damage. These illegal actions may be less humane than methods used by experienced WS personnel.

Impact on stakeholders, including aesthetics. The impacts of this Alternative on stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Property owners/managers receiving damage from beaver would likely strongly oppose this Alternative because they would bear the damage caused by beavers. Animal activists and a minority of environmental activists would prefer this Alternative because activists believe it is morally wrong to kill or use animals for any reason. Some people would support this Alternative because they enjoy seeing beaver, or having beaver nearby. However, while WS would take no action under this Alternative, other individuals or entities could conduct damage management activities resulting in impacts similar to Alternative 3.

4.2.2 Alternative 2: Only Lethal Beaver Damage Management

Effects on beaver populations. This Alternative could result in a localized decrease in the beaver population at the specific site where the damage management occurs. Even if WS lethally removed beavers at all project sites, it is not anticipated that more than 1,000 beavers would be killed annually by WS. Therefore, the impacts on beaver populations are expected to be similar to those described in Alternative 3. New beavers would likely re-inhabit the site as long as suitable habitat exists. The amount of time until new beaver move into the area would vary depending on the habitat type, time of year and population densities in the area. Beavers can expect to re-colonize some areas within 6 to 24 months after beaver removal is completed.

Effects on plants and other wildlife species, including T&E species. Non-target species, such as otter, muskrat and raccoons, may occasionally be killed during beaver damage management. Turtles may also be caught in some traps, but can generally be released alive. WS impacts on non-targets from capture methods would be similar to those described in Alternative 3. Impacts related to beaver dam removal would be similar to Alternative 1.

Effects on public and pet health and safety. WS impacts on public and pet health and safety would be similar to those described in Alternative 3, except in those situations where health and safety risks would be reduced by the use of nonlethal methods, such as the removal of beaver dams or the installation of water control structures. Since WS would not implement or recommend nonlethal control methods under this alternative, impacts related to nonlethal methods would be similar to Alternative 1.

Humaneness of methods to be used. WS personnel are experienced and professional in their use of management methods and methods are applied as humanely as possible. Under this Alternative, beavers would be humanely trapped or shot by experienced WS personnel using the best methods available. Beavers live-captured in traps or snares would be euthanized. Some animal activists

could perceive these methods as inhumane because they oppose all lethal methods of damage management.

Impacts on stakeholders, including aesthetics. The impacts of this Alternative on stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. This Alternative would likely be favored by resource owners who are receiving damage if lethal methods reduced damage to acceptable levels. Although, some resource owners would be saddened if the beaver were removed. Animal rights activists and a minority of environmental activists would strongly oppose this Alternative because they believe it is morally wrong to kill or use animals for any reason, or they believe the benefits from beavers would outweigh the associated damage. The ability to view and aesthetically enjoy beavers at a particular site could be limited if the beavers are removed. New animals, however, would most likely use the site in the future, although the length of time until new beavers arrive is variable, depending on the habitat type, time of year, and population densities of beavers in the area. The opportunity to view beavers is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

4.2.3 Alternative 3: Integrated Beaver Damage Management for all Public and Private Land (No Action and Proposed Action).

Effects on beaver populations. The current program removes only a very small number of beavers from the statewide Illinois population (Table 4-1) (see Section 1.2). Unlike Alternative 2, the use of exclusion, habitat modification, water control devices, etc. could be used as part of an IWDM approach. The use of water control devices or the removal of dams would have little or no effect on beaver populations. New beavers would likely re-inhabit the site after lethal removal activities as long as suitable habitat exists. The amount of time until new beavers move into the area would vary depending on the habitat type, time of year, and population densities in the area. Beavers can expect to re-colonize some areas within 6 to 24 months after beaver removal is completed.

Beaver Population Impact Analysis.

The authority for management of resident wildlife species is the responsibility of the IDNR. The IDNR compiles information on beaver take, and uses this information to manage beaver populations statewide.

The number of beavers killed by WS killed and harvested by fur trappers in IL is shown in Table 4-1 (MIS 1997, 1998, 1999 and 2000 and IDNR). The FY00 take of 6 was the highest number ever removed in one year by the WS program in Illinois. However, based upon an anticipated increase of work, IL WS expects that no more than 1,000 beavers would be removed annually while conducting WS direct control activities within the State. Therefore, 1,000 beavers was used to analyze potential impacts to the statewide beaver population in Illinois. The ADC FEIS (USDA 1997) determined using qualitative information (population trend indicators and harvest data) that if WS beaver kill is less than or equal to 33% of the total harvest, the magnitude is considered low. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. Considering the mean beaver fur harvest and take under Nuisance Control Permits for the years 1996-1999 is 7,508 beaver, an annual take of 1,000 beavers by WS would be only 13% of the total take in Illinois. Therefore, the magnitude of the impact of WS activity to the abundance can be

expected to be very low, given the total anticipated take is low when compared to the annual take of beavers in Illinois. Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in the beaver population.

Table 4-1. Beaver harvest data for Illinois, FY 1997-2000.

Beaver Harvest Data	1997	1998	1999	2000
Number removed by WS	0	1	1	6
Number taken during State-regulated harvest season	9406	3474	4393	unavailable at this time
% of WS take (% of total take)	0 %	0.03 %	0.02 %	unavailable at this time
Number of beaver taken under IDNR Nuisance Animal Permits	1915	1409	1518	unavailable at this time

Effects on plants and other wildlife species, including T&E species. Non-target species, such as otters, muskrats and raccoons may occasionally be taken during beaver damage management. Turtles may also be caught in some beaver traps, but can generally be released alive. WS personnel would minimize non-target takes with careful placement of traps or variation in capture methods. IL WS has taken no non-target animals during beaver management activities during FY 97 to FY 00.

WS does not expect the rate of non-target take to substantially increase above current program levels, although with an increase in beaver damage management expected, non-target take can reasonably be expected to increase over the current take of zero. The ADC FEIS (USDA 1997) determined using qualitative information (population trend indicators and harvest data) that if WS kill is less than or equal to 33% of the total harvest, the *magnitude* is considered low. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. Using available harvest data and the annual kill by WS, the magnitude is considered, and expected to remain, extremely low for WS take of all non-target animals in Illinois. Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in these populations. Any other non-targets that may incidentally be taken by WS is expected to be minimal (less than 10 individuals per year) and should have no adverse affect on statewide furbearer populations. No adverse effects on federally classified T&E species are expected from this Alternative. No adverse effects are expected from this Alternative to IDNR classified T&E species.

One anticipated outcome of this Alternative is a slight reduction in beaver damage and associated beaver impoundments. This reduction in beaver created impoundments would likely have an impact on other wildlife and plant species. The extent and nature of the impacts would depend upon the size of the beaver created impoundment and the diversity of plant and animal species in

the area. Some species would flourish, while others would diminish. The positive effects of beaver activities, including affected species, have been summarized in Section 1.3.1. The negative affects of increased beaver impoundments, including affected species, are described in Sections 1.3.2 and 1.3.3. The purpose of WS dam removal is to restore a free flowing condition to streams. In the long run, T&E species which use these stream environments should benefit from the restoration of this flow. T&E species are not anticipated to be adversely affected from this restoration effort because the goal of the effort is to re-establish natural free-flowing waters in habitat previously altered by the activity of the beaver.

Effects on public and pet health and safety. WS may occasionally uses binary explosives to breach beaver dams. WS personnel that use explosives are required to take and pass in-depth training, are certified to use explosives and must be able to demonstrate competence and safety in their use of explosives. They adhere to WS policies, as well as, regulations from the Bureau of Alcohol, Tobacco and Firearms, the Occupational Safety and Health Administration and the U.S. Department of Transportation with regards to explosives use, storage and transportation. Binary explosives require two components to be mixed before they can be actuated which virtually eliminates the hazard of accidental detonation during storage and transportation. Storage and transportation of mixed binary explosives is not allowed. When explosives are used, signs are placed to stop public entry. Where dams are near roads, police or other road officials are used to stop traffic and public entry, much like IDOT crews when they use explosives, to ensure public safety. Therefore, no adverse effects to public safety are expected from the use of explosives by WS.

WS methods of shooting and trapping pose minimal or no threat to public and pet health and safety. All firearm safety precautions are followed by WS when conducting damage management and WS complies with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles is sometimes used to reduce beaver damage when lethal methods are determined to be appropriate. Shooting is selective for target species and may be used in conjunction with spotlights. WS uses firearms to humanely euthanize beavers caught in live traps. WS' traps are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on all properties where traps are set to alert the public of their presence. Body-grip (e.g., Conibear-type) traps are restricted to water sets, which further reduces threats to public and pet health and safety.

Firearm use is very sensitive and a public concern because of misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within three months of their appointment and a refresher course every three years afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment*.

This Alternative would allow WS to use or recommend all available and effective damage reductions strategies and methods to reduce threats to public health and safety caused by beavers and beaver created dams. This alternative would have the greatest possibility of successfully alleviating beaver damage such as flooding and burrowing, damage to roads and railroads, risks of Giardiasis outbreaks, and possible mosquito borne disease outbreaks.

Humaneness of methods to be used. WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Under this Alternative, beavers would be trapped as humanely as possible or shot by experienced WS personnel using the best method available. Beavers live-captured in traps or snares would be euthanized. Some animal rights activists may perceive this method as inhumane because they oppose all lethal methods of damage management. This Alternative allows WS to consider and use non-lethal methods for beaver damage management when appropriate and therefore would be preferred to Alternative 2 by those individuals that consider lethal control methods as inhumane.

Impacts to stakeholders, including aesthetics. The impacts of this Alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. This Alternative would likely be favored by most resource owners who are receiving damage as it allows for an IWDMM approach to resolving damage problems. Most stakeholders without damage would also prefer this Alternative to Alternative 2, because non-lethal methods could be implemented when appropriate to resolve damage problems. Some animal activists and a minority of environmental activists would strongly oppose this Alternative, because they believe it is morally wrong to kill or use animals for any reason or they believe that the benefits from beavers outweigh the associated damage. The ability to view and aesthetically enjoy beavers at a particular site could be limited if the beavers are removed. New animals, however, would most likely use the site in the future, although the length of time until new beavers arrive is variable, depending on the habitat type, time of year, and population densities of beavers in the area. The opportunity to view beavers is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

4.2.4 Alternative 4: Technical Assistance Only.

Effects on beavers. WS would provide technical advice to those persons requesting assistance. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Overall impacts would be similar to Alternative 1.

Effects on plants and other wildlife species, including T&E species. Negative impacts to plant and wildlife species should be less than Alternative 1 when WS technical advice is requested and followed. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Overall impacts would be similar to Alternative 1.

Effects on public and pet health and safety. WS would provide technical advice to those persons requesting assistance. Negative impacts to public and pet safety should be less than Alternative 1 when WS technical advice is requested and followed. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Overall impacts would be similar to Alternative 1.

Humaneness of methods to be used. The issue of humaneness as it relates to WS use of control methods under this Alternative is not applicable because resource owners or others would be responsible to implement the damage management methods. WS would provide technical advice to those persons requesting assistance. Resource owners could use the information provided by WS

or implement their own damage reduction program without WS technical assistance. Overall impacts would be similar to Alternative 1.

Impact to stakeholders, including aesthetics. WS would provide technical advice to those persons requesting assistance. Resource owners could use the information provided by WS or implement their own damage reduction program without WS technical assistance. Overall impacts would be similar to Alternative 1.

4.2.5 Alternative 5: Non-lethal Beaver Damage Management.

Effects on beavers. No beavers would be killed by WS under this Alternative. Beaver populations could decrease, stay the same or increase depending on actions taken by others. The use of water control devices or the removal of dams by WS would have little or no effect on beaver populations. If WS nonlethal methods and recommendations are effective in reducing beaver damage to acceptable levels, beavers would not likely be lethally removed by affected resource owners. However in those situations where beaver damage is not reduced to acceptable levels by nonlethal methods, resource owners would likely implement their own lethal beaver damage management program resulting in impacts similar to Alternative 1.

Effects on plants and other wildlife species, including T&E species. WS impacts would be similar to Alternative 3, except the potential take of nontarget species by WS lethal control methods would not occur under this alternative. However, in the absence of an integrated beaver damage management program by WS that includes the option of lethal removal of beavers from damage sites, some resource owners may attempt to trap beavers or hire private trappers with little or no trapping experience resulting in impacts similar to Alternative 1.

Effects on public and pet health and safety. Non-lethal methods, exclusion and habitat modifications, would not be efficient or successful in resolving beaver damage in many situations. In those situations where WS nonlethal methods and recommendations are ineffective at reducing damage to acceptable levels impacts would be similar to Alternative 1. In those situations where they are effective, impacts would be similar to Alternative 3.

WS may occasionally use binary explosives to breach beaver dams. WS personnel that use explosives are required to take and pass in-depth training, are certified to use explosives and must be able to demonstrate competence and safety in their use of explosives. They adhere to WS policies as well as regulations from the Bureau of Alcohol, Tobacco and Firearms, the Occupational Safety and Health Administration and the Department of Transportation with regards to explosives use, storage and transportation. Binary explosives require two components to be mixed before they can be actuated which virtually eliminates the hazard of accidental detonation during storage and transportation. Storage and transportation of mixed binary explosives is not allowed. When explosives are used, signs are placed to stop public entry. Where dams are near roads, police or other road officials are used to stop traffic and public entry, much like IDOT crews when they use explosives, to ensure public safety. Therefore, no adverse effects to public safety are expected from the use of explosives by WS.

Humaneness of methods to be used. Under this Alternative, only non-lethal beaver damage management methods would be implemented by WS. Some animal activists may perceive this

approach as humane because they oppose all lethal methods of damage management. However, when nonlethal methods are ineffective at reducing damage to acceptable levels, resource owners may implement their own lethal damage management program or take illegal action against some local populations of beaver out of frustration of continued damage resulting in impacts similar to Alternative 1.

Impact to stakeholders, including aesthetics. While WS would provide non-lethal assistance under this Alternative, other individuals or entities could conduct lethal damage management. The impacts of this Alternative to stakeholders would be variable depending on the effectiveness of WS nonlethal methods and actions taken by resource owners. This Alternative would not be favored by most resource owners who are receiving damage when nonlethal methods do not reduce damage to acceptable levels. Most stakeholders without damage would prefer this Alternative to Alternative 2, because non-lethal methods would be implemented to resolve damage problems. Some animal activists and a minority of environmental activists would strongly support this Alternative because they believe it is morally wrong to kill or use animals for any reason or they believe that the benefits from beavers outweigh the associated damage. However, if resource owners reject WS nonlethal control methods and implement their own control program impacts would be similar to Alternative 1.

4.3 SUMMARY OF WS' IMPACTS

Table 4-2 presents a relative comparison of the anticipated impacts of each of the Alternatives as they relate to each of the major issues identified in Chapter 2.

No significant cumulative environmental impacts are expected from any of the Alternatives (Table 4-2). With regard to Alternatives 2, Lethal Removal Only, and Alternative 3, the Proposed Action, the lethal removal of beavers causing damage would have no adverse affect on beaver populations in the State of Illinois. No adverse risk to public or pet health and safety is expected from control methods implemented by WS under Alternatives 2,3 and 5, including the proposed Alternative. Although some persons would likely oppose lethal removal of beaver, the analysis in this EA indicates that such removals would result in no significant cumulative adverse impacts on the quality of the human environment.

Table 4-2. Relative comparison of the anticipated impacts of each Alternative.

Issues/Impacts	Alternative 1: No Program	Alternative 2: Lethal Only	Alternative 3: IWDN Program (Proposed Action/No Action)	Alternative 4: Technical Assistance	Alternative 5: Non-lethal Only
Beaver Populations	Populations could increase unless resource owners seek private help	Possible reduction in local populations, no statewide effect.	Possible reduction in local populations, no statewide effect.	Populations could increase unless resource owners seek private help	Populations could increase unless resource owners seek private help
Non-target Species, Including T&E Species	No effects by WS	No adverse impact to T&E or non- target species populations.	No adverse impact to T&E or non- target species populations.	No effects by WS	No adverse impact to T&E or non-target species populations
Public and Pet Safety	Continued risk from flooding, burrowing and diseases.	No threat to public and pet safety from WS control methods. Reduction of risks from flooding, burrowing and diseases.	No threat to public and pet safety from WS control methods. Reduction of risks from flooding, burrowing and diseases.	Continued risk from flooding, burrowing and diseases.	No threat to public and pet safety from WS control methods. Reduction of risks from flooding, burrowing and diseases.
Humaneness of Method	Not applicable because no action by WS.	WS uses the most humane methods available. Some activists would oppose all lethal methods.	WS uses the most humane methods available. Some activists would oppose all lethal methods.	Probably considered more humane by most people than lethal measures.	Probably considered more humane by most people than lethal measures.
Impact to Stakeholders, Including Aesthetics	Variable. Some people prefer this method. Those receiving damage probably oppose this Alternative.	Variable. Those receiving damage would probably favor this Alternative if damage could be reduced by lethal methods. Some activists would oppose this Alternative.	Variable. Those receiving damage would probably favor this Alternative. Some activists would oppose this Alternative.	Variable. Some people prefer this method. Those receiving damage probably oppose this Alternative	Variable. Those receiving damage would probably favor this Alternative if damage could be reduced by nonlethal methods. Some activists would favor this Alternative

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APPENDIX B

AUTHORITY AND COMPLIANCE

The USDA is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the WS program is the Animal Damage Control Act of March 2, 1931, as amended (7 U.S. C. 426-426c; 46 Stat. 1468), which provides that:

“The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jackrabbits, brown tree snakes and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, furbearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals. Provided that in carrying out the provisions of this Section, the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions.”

Since 1931, with the changes in societal values, WS policies and its programs place greater emphasis on the part of the Act discussing *bringing (damage) under control, rather than eradication and suppression* of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

“That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammals and birds species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities.”

Illinois Department of Natural Resources

The IDNR is authorized by the Wildlife Code (Chapter 520) of the Illinois Conservation Law to manage beaver as a furbearing mammal. This Chapter provides standards for the establishment of regulated trapping seasons and allowances for Nuisance Animal Removal Permits.

A Memorandum of Understanding (MOU) between USDA-APHIS-WS, the [REDACTED] and other State agencies provides for participation between signatory agencies in a cooperative effort to manage damage caused by wildlife in Illinois. This MOU establishes a cooperative relationship between WS, [REDACTED] for planning, coordinating and implementing wildlife damage management policies to prevent or minimize

damage caused by wild animal species (including threatened and endangered species) to agriculture, horticulture, aquaculture, animal husbandry, forestry, wildlife, public health/safety, property, natural resources and to facilitate the exchange of information among the cooperating agencies.

Compliance with Other Federal Laws

Several federal laws regulate WS wildlife damage management. WS complies with these laws and statutes, and consults and cooperates with other agencies as appropriate.

National Environmental Policy Act (NEPA). Environmental documents pursuant to NEPA must be completed before actions consistent with the NEPA decision can be implemented. WS also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any wildlife damage management that may affect resources managed by these agencies or affect other areas of mutual concern.

Endangered Species Act (ESA). It is federal policy, under the ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec. 2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that *“any action authorized, funded or carried out by such an agency. . . is not likely to jeopardize the continued existence of any endangered or threatened species. . . Each agency shall use the best scientific and commercial data available”* (Sec. 7(a)(2)).

Clean Water Act (Section 404). Section 404 (33 U.S.C. 1344) of the Clean Water Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the USACE unless the specific activity is exempted in 33 CFR 323 or covered by a nationwide permit in 33 CFR 330. The breaching of most beaver dams are covered by these regulations (33 CFR 323 and 330). In addition, a recent court decision, the Tulloch Rule Decision, determined that minimal quantities of material released during excavation activities, such as may occur during beaver dam breaching, may be considered *“incidental fallback”* which would not be governed by Section 404 and is allowed (Wayland and Shaeffer 1997).

Food Security Act. The Wetland Conservation provision (Swampbuster) of the 1985 (16 U.S.C. 3801-3862), 1990 (as amended by PL 101-624), and 1996 (as amended by PL 104-127) farm bills require all agricultural producers to protect wetlands on the farms they own. Wetlands converted to farmland prior to December 23, 1985 are not subject to wetland compliance provisions even if wetland conditions return as a result of lack of maintenance or management. If prior converted cropland is not planted to an agricultural commodity (crops, native and improved pastures, rangeland, tree farms, and livestock production) for more than 5 consecutive years and wetland characteristics return, the cropland is considered abandoned and then becomes a wetland subject to regulations under Swampbuster and Section 404 of the Clean Water Act. The Natural Resource Conservation Service is responsible for certifying wetland determinations according to this Act.

APPENDIX C

CRITERIA FOR BEAVER DAM BREACHING/REMOVAL

Beaver dam breaching is generally conducted to maintain existing stream channels and drainage patterns and reduce flood waters. Beaver dams are made from natural debris such as logs, sticks and mud that beaver take from the area. It is this portion that is dislodged during a beaver dam breaching operation. The impoundments that WS removes are normally from recent beaver activity and have not been in place long enough to take on the qualities of a true wetland (i.e., hydric soils, aquatic vegetation, preexisting function). Beaver dam breaching by hand, mechanically or with binary explosives does not affect the substrate or the natural course of the stream and returns the area back to its preexisting condition with similar flows and circulations. Because beaver dams involve waters of the United States, dam breaching is regulated under Section 404 of the Clean Water Act (CWA).

Wetlands are recognized by three characteristics: hydric soils, hydrophytic vegetation and general hydrology. Hydric soils are either composed of, or have a thick surface layer of, decomposed plant materials (muck) while sandy soils have dark stains or streaks from organic material in the upper layer where plant material has attached to soil particles. Additionally, hydric soils may be bluish gray or gray below the surface or brownish black to black and have the smell of rotten eggs. Wetlands also have hydrophytic vegetation present such as cattails, bulrushes, willows, sedges and water plantains. The final indicator is general hydrology which includes standing and flowing water or waterlogged soils during the growing season, such as high water marks present on trees and drift lines of small piles of debris. Beaver dams usually will develop a layer of organic material at the surface because siltation can occur rapidly, but aquatic vegetation and high water marks (a new high water mark is created by the beaver dam) are usually not present. However, cattails and willows can show up rapidly if they are in the vicinity, but most other hydrophytic vegetation takes time to establish.

When a dam is breached, debris is discharged into the water and the debris that ends up in the water may be considered *incidental fallback* or an incidental discharge of fill in waters of the U.S. The Tulloch Rule Decision (Court Case No. 93cv01754) determined that *incidental fallback* did not trigger Section 404 permit requirements. It was not determined if beaver dams fit this category, but EPA and the USACE issued guidance to their regulatory offices that beaver dam breaching may not require permits under Section 404 (Wayland and Shaeffer 1997). These agencies stated that they would give their field offices further guidance at a later date. However, in most beaver dam breaching operations, the material that is displaced is exempt from regulation under Section 404 of the CWA (33 CFR Part 323). A permit would be required if the impoundment caused by a beaver dam was considered a true wetland. WS personnel survey the beaver dam site and impoundment and determine whether conditions exist suggest that the area may be a wetland as defined above. If such conditions exist, the landowner is asked the age of the dam or how long he/she has known of its presence to determine whether Swampbuster, Section 404 permit exemptions or NWP allow breaching of the dam. If not, the landowner is required to obtain a Section 404 permit before the dam could be removed by WS personnel.

The following explains Section 404 exemptions and conditions that pertain to the breaching of beaver dams.

33 CFR 323 - Permits For Discharges of Dredged or Fill Material into Waters of the United States.

This regulation provides guidance to determine whether certain activities require permits under Section

Part 323.4 Discharges not requiring permits. This section establishes exemptions for discharging certain types of fill into waters of the United States without a permit. Certain minor drainage activities connected with normal farming, ranching, and silviculture activities where they have been established do not require a permit as long as these drainages do not include the immediate or gradual conversion of a wetland (i.e., beaver ponds greater than 5 years old) to a non-wetland. Specifically, part (a)(1)(iii)(C)(i) states, “...*fill material incidental to connecting upland drainage facilities (e.g., drainage ditches) to waters of the United States, adequate to effect the removal of excess soil moisture from upland croplands...*”. This indicates that beaver dams that block ditches, canals, or other structures designed to drain water from upland crop fields can be breached without a permit.

Moreover, (a)(1)(iii)(C)(iv) states the following types of activities do not require a permit “*The discharges of dredged or fill materials incidental to the emergency removal of sandbars, gravel bars, or other similar blockages which are formed during flood flows or other events, where such blockages close or constrict previously existing drainageways and, if not promptly removed, would result in damage to or loss of existing crops or would impair or prevent the plowing, seeding, harvesting or cultivating of crops on land in established use for crop production. Such removal does not include enlarging or extending the dimensions of, or changing the bottom elevations of, the affected drainageway as it existed prior to the formation of the blockage. Removal must be accomplished within one year of discovery of such blockages in order to be eligible for exemption.*”; this allows the breaching of beaver dams in natural streams to restore drainage of agricultural lands within one year of discovery.

Part 323.4 (a) (2) allows “*Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption.*”; this allows beaver dams to be breached without a permit where they have resulted in damage to roads, culverts, bridges, or levees if it is done in a reasonable amount of time.

33 CFR 330 - Nationwide Permit (NWP) Program. The USACE, Chief of Engineers is authorized to grant certain dredge and fill activities on a nationwide basis if they have minimal impact on the environment. The NWP’s are listed in Appendix A of 33 CFR 330 and permittees must satisfy all terms and conditions established to qualify for their use. Individual beaver dam breaching by WS may be covered by any of the following NWPs if not already exempted from permit requirements by the regulations discussed above. WS complies with all conditions and restrictions placed on NWP’s for any instance of beaver dam breaching done under a specific NWP.

Nationwide permits can be used **except** in any component of the National Wild and Scenic River System such as waterways listed as an “*Outstanding Water Resource*”, or any waterbody which is part of an area designated for “*Recreational or Ecological Significance*”.

NWP 3 authorizes the rehabilitation of those structures, such as culverts, homes, and bridges,

destroyed by floods and “discrete events,” such as beaver dams, provided that the activity is commenced within 2 years of the date when the beaver dam was established.

NWP 18 allows minor discharges of dredged and fill material, including the breaching of beaver dams, into all waters of the United States provided that the quantity of discharge and the volume of excavated area does not exceed 10 cubic yards below the plane of the ordinary high water mark (this is normally well below the level of the beaver dam) or is in a “special aquatic site” (wetlands, mudflats, vegetated shallows, riffle and pool complexes, sanctuaries, and refuges). The District Engineer must be “notified” (general conditions for notification apply), if the discharge is between 10-25 cubic yards for a single project or the project is in a special aquatic site and less than $\frac{1}{10}$ of an acre is expected to be lost. If the values are greater than those given, a permit is required. Beaver dams rarely would exceed 2 or 3 cubic yards of backfill into the waters and probably no more than 5 cubic yards would ever be exceeded. Therefore, this stipulation is not restrictive. Beaver dams periodically may be breached in a special aquatic area, but normally the aquatic site will be returned to normal. However, if a true wetland exists, and beaver dam breaching is not allowed under another permit, then a permit must be obtained from the District Engineer.

NWP 27 provides for the discharge of dredge and fill for activities associated with the restoration of wetland and riparian areas with certain restrictions. On non-federal public and private lands, the owner must have: a binding agreement with USFWS or NRCS to conduct restoration; a voluntary wetland restoration project documented by NRCS; or notify the District Engineer according to “notification” procedures. On federal lands, including USACE and USFWS, wetland restoration can take place without any contract or notification. This NWP “...applies to restoration projects that serve the purpose of restoring “natural” wetland hydrology, vegetation, and function to altered and degraded non-tidal wetlands and “natural” functions of riparian areas. This NWP does not authorize the conversion of natural wetlands to another aquatic use...” If operating under this permit, the breaching of a beaver dam would be allowed as long as it was not a true wetland (i.e., 5 or more years old), and for non-federal public and private lands the appropriate agreement, project documentation, or notification is in place.

A quick response without delays resulting from permitting requirements can be critical to the success of minimizing or preventing damage. Exemptions contained in the above regulations or NWP’s provide for the breaching of the majority of beaver dams that Illinois WS encounters. The primary determination that must be made by WS personnel is whether a beaver impounded area has become a true wetland or is just a flooded area. The flexibility allowed by these exemptions and NWP’s is important for the efficient and effective resolution of many beaver damage problems because damage escalates rapidly in many cases the longer an area remains flooded.

APPENDIX D

LIST OF FEDERALLY AND STATE LISTED THREATENED AND ENDANGERED SPECIES IN ILLINOIS

Endangered

Acipenser fulvescens (lake sturgeon)
Etheostoma camurum (bluebreast darter)
Etheostoma exile (Iowa darter)
Etheostoma histrio (Harlequin darter)
Hybognathus hayi (cypress minnow)
Ichthyomyzon fossor (northern brook lamprey)
Macrhybopsis gelida (sturgeon chub)
Moxostoma valenciennesi (greater redhorse)
Nocomis micropogon (river chub)
Notropis anogenus (pugnose shiner)
Notropis boops (bigeye shiner)
Notropis heterolepis (blacknose shiner)
Notropis maculatus (taillight shiner)
Notropis texanus (weed shiner)
Noturus stigmosus (northern madtom)
Platygobio gracilis (flathead chub)
Pteronotropis hubbsi (bluehead shiner)
Scaphirhynchus albus (pallid sturgeon)**

Endangered

Ambystoma x platineum (silvery salamander)
Cryptobranchus alleganiensis (hellbender)
Desmognathus fuscus (dusky salamander)

Endangered

Clemmys guttata (spotted turtle)
Kinosternon flavescens (Illinois mud turtle)
Macrolemys temminckii (alligator snapping turtle)
Masticophis flagellum (coachwhip)
Nerodia fasciata (broad-banded water snake)
Pseudemys concinna (river cooter)
Sistrurus catenatus catenatus (eastern massasauga)
Thamnophis sauritus (eastern ribbon snake)

FISH

Threatened

Catostomus catostomus (longnose sucker)
Coregonus artedii (cisco or lake herring)
Fundulus diaphanus (banded killifish)
Lampetra aepyptera (least brook lamprey)
Lepomis symmetricus (bantam sunfish)
Moxostoma carinatum (river redhorse)
Notropis chalybaeus (ironcolor shiner)
Notropis heterodon (blackchin shiner)

AMPHIBIANS

Threatened

Ambystoma jeffersonianum (Jefferson salamander)
Hemidactylium scutatum (four-toed salamander)
Hyla avivoca (bird-voiced treefrog)
Pseudacris streckeri illinoensis (Illinois chorus frog)

REPTILES

Threatened

Clonophis kirtlandii (Kirtland's snake)
Crotalus horridus (timber rattlesnake)
Elaphe guttata emoryi (great plains rat snake)
Emydoidea blandingii (Blanding's turtle)
Heterodon nasicus (western hognose snake)
Nerodia cyclopion (Mississippi green water snake)
Tantilla gracilis (flathead snake)

BIRDS

Endangered

Ammodramus henslowii (Henslow's sparrow)
Asio flammeus (short-eared owl)
Bartramia longicauda (upland sandpiper)
Botaurus lentiginosus (American bittern)
Buteo swainsoni (Swainson's hawk)
Charadrius melodus (piping plover)**
Chlidonias niger (black tern)
Circus cyaneus (northern harrier)
Egretta caerulea (little blue heron)
Egretta thula (snowy egret)
Falco peregrinus (peregrine falcon)
Ictinia mississippiensis (Mississippi kite)
Laterallus jamaicensis (black rail)
Limnothlypis swainsonii (Swainson's warbler)
Nyctanassa violacea (yellow-crowned night-heron)
Nycticorax nycticorax (black-crowned night-heron)
Pandion haliaetus (osprey)
Phalaropus tricolor (Wilson's phalarope)
Rallus elegans (king rail)
Sterna antillarum (least tern)**
Sterna forsteri (Forster's tern)
Sterna hirundo (common tern)
Thryomanes bewickii (Bewick's wren)
Tympanuchus cupido (greater prairie-chicken)
Tyto alba (common barn-owl)
Xanthocephalus xanthocephalus (yellow-headed blackbird)

Threatened

Buteo lineatus (red-shouldered hawk)
Certhia americana (brown creeper)
Gallinula chloropus (common moorhen)
Grus canadensis (sandhill crane)
Haliaeetus leucocephalus (bald eagle)*
Ixobrychus exilis (least bittern)
Lanius ludovicianus (loggerhead shrike)
Podilymbus podiceps (pied-billed grebe)

MAMMALS

Endangered

Corynorhinus rafinesquii (eastern big-eared bat)
Myotis austroriparius (southeastern bat)
Myotis grisescens (gray bat)**
Myotis sodalis (Indiana bat)**
Neotoma floridana (eastern woodrat)

Threatened

Lontra canadensis (river otter)
Ochrotomys nuttalli (golden mouse)
Oryzomys palustris (marsh rice rat)

INVERTEBRATES

Endangered

Snails

Discus macclintocki (pleistocene disc)**

Mussels

Cumberlandia monodonta (spectacle case mussel)
Cyprogenia stegaria (fanshell mussel)**
Epioblasma triquetra (snuffbox mussel)
Lampsilis abrupta (pink mucket)**
Lampsilis fasciola (wavy-rayed lampmussel)
Lampsilis higginsii (Higgins eye)**
Obovaria subrotunda (round hickorynut mussel)

Threatened

Mussels

Alasmodonta viridis (slippershell mussel)
Cyclonaias tuberculata (purple wartyback)
Ellipsaria lineolata (butterfly)
Elliptio crassidens (elephant-ear mussel)
Elliptio dilatata (spike)
Fusconaia ebena (ebonyshell)
Ligumia recta (black sandshell)

Plethobasus cooperianus (orange-foot pimpleback)**
 Plethobasus cyphus (sheepnose mussel)
 Pleurobema clava (clubshell mussel)**
 Pleurobema cordatum (Ohio pigtoe)
 Pleurobema rubrum (pyramid pigtoe)
 Potamilus capax (fat pocketbook pearly mussel)**
 Ptychobranhus fasciolaris (kidneyshell mussel)
 Quadrula cylindrica (rabbitsfoot mussel)
 Simpsonaias ambigua (salamander mussel)
 Toxolasma lividus (purple lilliput mussel)
 Villosa fabalis (rayed bean mussel)
 Villosa iris (rainbow mussel)
 Villosa lienosa (little spectacle case mussel)

Crustaceans

Caecidotea lesliei (isopod)
 Crangonyx anomalus (amphipod)
 Crangonyx antennatus (amphipod)
 Crangonyx packardi (amphipod)
 Gammarus acherondytes (Illinois cave amphipod)**
 Orconectes indianensis (Indiana crayfish)
 Orconectes kentuckiensis (Kentucky crayfish)
 Orconectes lancifer (oxbow crayfish)
 Orconectes placidus (crayfish)
 Stygobromus iowae (Iowa amphipod)

Dragonflies

Somatochlora hineana (Hine's emerald dragonfly)**

Leafhoppers

Paraphlepsius lupalus (leafhopper)

Butterflies and Moths

Atrytone arogos (arogos skipper)
 Calephelis muticum (swamp metalmark)
 Lycaeides melissa samuelis (Karner blue butterfly)**
 Papaipema eryngii (rattlesnake-master borer moth)

Crustaceans

Gammarus bousfieldi (Bousfield's amphipod)

Dragonflies

Nannothemis bella (elfin skimmer)

Leafhoppers

Aflexia rubranura (redveined prairie leafhopper)

Butterflies and Moths

Hesperia metea (cobweb skipper)
 Hesperia ottoe (ottoe skipper)
 Speyeria idalia (regal fritillary)

LICHENS

Endangered

Phaeophyscia leana (Lea's bog lichen)

PLANTS

Endangered

Adoxa moschatellina (moschatel)
 Alnus incana ssp rugosa (speckled alder)
 Amelanchier interior (shadbush)
 Amelanchier sanguinea (shadbush)
 Ammophila breviligulata (beach grass)
 Amorpha nitens (smooth false indigo)

Threatened

Agalinis skinneriana (pale false foxglove)
 Arenaria patula (slender sandwort)
 Aristolochia serpentaria var hastata (narrow-leaved snakeroot)
 Aster furcatus (forked aster)
 Besseyia bullii (kitten tails)
 Boltonia decurrens (decurent false aster)*

Arctostaphylos uva-ursi (bearberry)
Artemisia dracunculus (false tarragon)
Asclepias lanuginosa (woolly milkweed)
Asclepias meadii (Mead's milkweed)*
Asclepias ovalifolia (oval milkweed)
Asclepias stenophylla (narrow-leaved green milkweed)
Asplenium bradleyi (Bradley's spleenwort)
Asplenium resiliens (black spleenwort)
Astragalus crassicaulus var *trichocalyx* (large ground plum)
Astragalus tennesseensis (Tennessee milk-vetch)
Bartonia paniculata (screwstem)
Beckmannia syzigachne (American slough grass)
Berberis canadensis (Allegheny barberry)
Berchemia scandens (supple-jack)
Betula alleghaniensis (yellow birch)
Betula populifolia (gray birch)
Bidens beckii (water marigold)
Botrychium matricariifolium (daisy-leaf grape fern)
Botrychium multifidum (northern grape fern)
Botrychium simplex (grape fern)
Bouteloua gracilis (blue grama)
Bumelia lanuginosa (wooly buckthorn)
Calamagrostis inasperata (bluejoint grass)
Calla palustris (water arum)
Calopogon tuberosus (grass pink orchid)
Camassia angusta (wild hyacinth)
Cardamine pratensis var *palustris* (cuckoo flower)
Carex alata (winged sedge)
Carex arkansana (Arkansas sedge)
Carex aurea (golden sedge)
Carex brunnescens (brownish sedge)
Carex canescens var *disjuncta* (silvery sedge)
Carex chordorrhiza (cordroot sedge)
Carex crawfordii (crawford sedge)
Carex cryptolepis (sedge)
Carex decomposita (cypress-knee sedge)
Carex disperma (shortleaf sedge)
Carex echinata (little prickly sedge)
Carex garberi (elk sedge)
Carex gigantea (large sedge)
Carex lucorum (sedge)
Carex nigromarginata (black-edged sedge)
Carex oligosperma (few-seeded sedge)
Carex physorhyncha (Bellow's-beak sedge)
Carex reniformis (reniform sedge)
Carex striatula (lined sedge)
Carex trisperma (three-seeded sedge)
Carex tuckermanii (Tuckerman's sedge)
Carya pallida (pale hickory)
Castilleja sessiliflora (downy yellow painted cup)
Ceanothus herbaceus (redroot)
Chamaesyce polygonifolia (seaside spurge)
Botrychium biternatum (southern grape fern)
Cakile edentula (sea rocket)
Carex communis (fibrous-rooted sedge)
Carex intumescens (swollen sedge)
Carex oxylepis (sharp-scaled sedge)
Carex prasina (drooping sedge)
Carex viridula (little green sedge)
Carex willdenowii (Willdenow's sedge)
Carex woodii (pretty sedge)
Chamaedaphne calyculata (leatherleaf)
Cimicifuga rubifolia (black cohosh)
Cirsium hillii (Hill's thistle)
Cirsium pitcheri (Pitcher's (dune) thistle)*
Corallorhiza maculata (spotted coral-root orchid)
Cyperus grayioides (Gray's umbrella sedge)
Cypripedium candidum (white lady's-slipper orchid)
Drosera intermedia (narrow-leaved sundew)
Eleocharis rostellata (beaked spike rush)
Epilobium strictum (downy willow herb)
Equisetum pratense (meadow horsetail)
Erythronium mesochoreum (white dog-tooth violet)
Eupatorium incarnatum (thoroughwort)
Galium labradoricum (bog bedstraw)
Helianthus angustifolius (narrow-leaved sunflower)
Juniperus communis (common juniper)
Lactuca hirsuta (wild lettuce)
Larix laricina (tamarack)
Lathyrus ochroleucus (pale vetchling)
Lechea intermedia (pinweed)
Liatris scariosa var *nieuwlandii* (blazing star)
Matelea obliqua (climbing milkweed)
Melanthium virginicum (bunch-flower)
Melothria pendula (squirting cucumber)
Oenothera perennis (small sundrops)
Orobanche ludoviciana (broomrape)
Planera aquatica (water elm)
Potamogeton gramineus (pondweed)
Quercus montana (rock chestnut oak)
Quercus phellos (willow oak)
Ranunculus rhomboideus (prairie buttercup)
Rhynchospora alba (beaked rush)
Rubus pubescens (dwarf raspberry)
Salvia azurea ssp *pitcheri* (blue sage)
Scirpus hallii (Hall's bulrush)
Scirpus polyphyllus (leafy bulrush)
Solidago sciaphila (cliff goldenrod)
Styrax americana (storax)
Sullivantia renifolia (sullivantia)
Thuja occidentalis (arbor vitae)
Tofieldia glutinosa (false asphodel)
Tomanthera auriculata (earleaf foxglove)
Tradescantia bracteata (prairie spiderwort)

Chimaphila maculata (spotted wintergreen)	Trientalis borealis (star-flower)
Chimaphila umbellata (pipsissewa)	Triglochin maritimum (arrow-grass)
Cimicifuga americana (American bugbane)	Triglochin palustris (arrow-grass)
Cimicifuga racemosa (black cohosh)	Urtica chamaedryoides (nettle)
Circaea alpina (small enchanter's nightshade)	Veratrum woodii (false hellebore)
Cladrastis lutea (yellowwood)	Veronica scutellata (marsh-speedwell)
Clematis crispa (blue jasmine)	Viburnum molle (arrowwood)
Clematis occidentalis (mountain clematis)	Viola conspersa (dog violet)
Clematis viorna (leatherflower)	
Collinsia violacea (violet collinsia)	
Comptonia peregrina (sweet-fern)	
Conioselinum chinense (hemlock parsley)	
Cornus canadensis (bunchberry)	
Corydalis aurea (golden corydalis)	
Corydalis halei (Hale's corydalis)	
Corydalis sempervirens (pink corydalis)	
Corylus rostrata (beaked hazelnut)	
Cynosciadium digitatum (finger dog-shade)	
Cyperus lancastriensis (galingale)	
Cypripedium acaule (lady's-slipper orchid)	
Cypripedium parviflorum (small yellow lady's-slipper orchid)	
Cypripedium reginae (showy lady's-slipper orchid)	
Cystopteris x laurentiana (laurentian fragile fern)	
Dalea foliosa (leafy prairie clover)**	
Dennstaedtia punctilobula (hay-scented fern)	
Draba cuneifolia (whitlow grass)	
Drosera rotundifolia (round-leaved sundew)	
Dryopteris celsa (log fern)	
Echinodorus tenellus (small burhead)	
Eleocharis olivacea (capitate spike rush)	
Eleocharis pauciflora (few-flowered spike rush)	
Equisetum scirpoides (dwarf scouring rush)	
Equisetum sylvaticum (horsetail)	
Eriophorum virginicum (rusty cotton grass)	
Eryngium prostratum (eryngo)	
Euonymus americanus (strawberry bush)	
Euphorbia spathulata (spurge)	
Filipendula rubra (queen-of-the-prairie)	
Fimbristylis vahlii (Vahl's fimbristylis)	
Galactia mohlenbrockii (Boykin's dioclea)	
Galium lanceolatum (wild licorice)	
Galium virgatum (dwarf bedstraw)	
Gaultheria procumbens (wintergreen)	
Geranium bicknellii (northern cranesbill)	
Glyceria arkansana (manna grass)	
Gymnocarpium dryopteris (oak fern)	
Gymnocarpium robertianum (scented oak fern)	
Hackelia americana (stickseed)	
Halesia carolina (silverbell tree)	
Helianthus giganteus (tall sunflower)	
Heliotropium tenellum (slender heliotrope)	
Heteranthera reniformis (mud plantain)	

Hexalectris spicata (crested coral-root orchid)
Hudsonia tomentosa (false heather)
Hydrocotyle ranunculoides (water-pennywort)
Hydrolea uniflora (one-flowered hydrolea)
Hymenoxys herbacea (lakeside daisy)*
Hypericum adpressum (shore St. John's wort)
Hypericum kalmianum (kalm St. John's-wort)
Iliamna remota (Kankakee mallow)
Iresine rhizomatosa (bloodleaf)
Isoetes butleri (quillwort)
Isotria medeoloides (small whorled pogonia)
Isotria verticillata (whorled pogonia)*
Juncus alpinus (Richardson's rush)
Juncus vaseyi (Vasey's rush)
Juniperus horizontalis (trailing juniper)
Justicia ovata (water willow)
Lathyrus japonicus var *glaber* (beach pea)
Lespedeza leptostachya (prairie bush clover)*
Lesquerella ludoviciana (silvery bladder pod)
Lonicera dioica var *glaucescens* (red honeysuckle)
Lonicera flava (yellow honeysuckle)
Luzula acuminata (wood rush)
Lycopodium clavatum (common clubmoss)
Lycopodium dendroideum (ground pine)
Lycopodium inundatum (bog clubmoss)
Lysimachia fraseri (loosestrife)
Lysimachia radicans (creeping loosestrife)
Malus angustifolia (narrow-leaved crabapple)
Matelea decipiens (climbing milkweed)
Medeola virginiana (indian cucumber root)
Melanchthera nivea (white melanchthera)
Melica mutica (two-flowered melic grass)
Milium effusum (millet grass)
Mimulus glabratus (yellow monkeyflower)
Mirabilis hirsuta (hairy umbrella-wort)
Nothocalais cuspidata (prairie dandelion)
Opuntia fragilis (fragile prickly pear)
Orobancha fasciculata (clustered broomrape)
Oxalis illinoensis (Illinois wood sorrel)
Panicum boreale (northern panic grass)
Panicum columbianum (panic grass)
Panicum jorii (panic grass)
Panicum ravenelii (Ravenel's panic grass)
Panicum yadkinense (panic grass)
Paspalum dissectum (bead grass)
Penstemon brevisepalus (short-sepaled beardstongue)
Penstemon grandiflorus (large-flowered beardtongue)
Phacelia gilioides (phacelia)
Phlox pilosa ssp *sangamonensis* (sangamon phlox)
Pinus banksiana (jack pine)
Pinus echinata (shortleaf pine)
Pinus resinosa (red pine)

Plantago cordata (heart-leaved plantain)
Platanthera ciliaris (yellow fringed orchid)
Platanthera clavellata (wood orchid)
Platanthera flava var *flava* (tubercled orchid)
Platanthera flava var *herbiola* (tubercled orchid)
Platanthera leucophaea (white fringed orchid)*
Platanthera psycodes (purple fringed orchid)
Poa alsodes (woodland bluegrass)
Poa languida (woodland bluegrass)
Poa wolfii (meadow bluegrass)
Pogonia ophioglossoides (snake-mouth)
Polanisia jamesii (James clammyweed)
Polygala incarnata (pink milkwort)
Polygonatum pubescens (small solomon's seal)
Polygonum arifolium (halbred-leaved tearthumb)
Polygonum careyi (Carey's smartweed)
Populus balsamifera (balsam poplar)
Potamogeton praelongus (pondweed)
Potamogeton pulcher (pondweed)
Potamogeton robbinsii (pondweed)
Potamogeton strictifolius (pondweed)
Potentilla millegrana (cinquefoil)
Primula mistassinica (bird's-eye primrose)
Ptilimnium nuttallii (mock bishop's weed)
Puccinellia pallida (pale manna-grass)
Pycnanthemum albescens (white mountain mint)
Pycnanthemum torrei (mountain mint)
Quercus nuttallii (Nuttall's oak)
Ranunculus cymbalaria (seaside crowfoot)
Rhamnus alnifolia (alder buckthorn)
Rhynchospora glomerata (clustered beaked rush)
Ribes hirtellum (northern gooseberry)
Rosa acicularis (rose)
Rubus odoratus (purple flowering raspberry)
Rubus setosus (bristly blackberry)
Rudbeckia missouriensis (Missouri orange coneflower)
Sabatia campestris (prairie rose gentian)
Sagittaria longirostra (arrowleaf)
Salix serissima (autumn willow)
Salix syrticola (sand-dune willow)
Sambucus pubens (red-berried elder)
Sanguisorba canadensis (American burnet)
Sarracenia purpurea (pitcher plant)
Saxifraga virginensis (early saxifrage)
Schizachne purpurascens (false melic grass)
Scirpus cespitosus (tufted bulrush)
Scirpus hattorianus (bulrush)
Scirpus paludosus (alkali bulrush)
Scirpus purshianus (weak bulrush)
Scirpus smithii (Smith's bulrush)
Scirpus verecundus (bashful bulrush)
Shepherdia canadensis (buffalo berry)

Silene ovata (ovate catchfly)
Silene regia (royal catchfly)
Silphium trifoliatum (rosinweed)
Sisyrinchium atlanticum (blue-eyed grass)
Sisyrinchium montanum (blue-eyed grass)
Sorbus americana (American mountain-ash)
Sparganium americanum (bur-reed)
Sparganium chlorocarpum (greenfruited bur-reed)
Spiranthes lucida (yellow-lipped ladies' tresses)
Spiranthes romanzoffiana (hooded ladies' tresses)
Spiranthes vernalis (ladies' tresses)
Stellaria pubera (great chickweed)
Stenanthium gramineum (grass-leaved lily)
Stylisma pickeringii (patterson bindweed)
Styrax grandifolia (bigleaf snowbell bush)
Symphoricarpos albus var *albus* (snowberry)
Synandra hispidula (hairy synandra)
Talinum calycinum (large flower-of-an-hour)
Thalia dealbata (powdery thalia)
Thelypteris noveboracensis (New York fern)
Thelypteris phegopteris (long beech fern)
Tilia heterophylla (white basswood)
Triadenum virginicum (marsh St. John's wort)
Trichomanes boschianum (filmy fern)
Trifolium reflexum (buffalo clover)
Trillium cernuum (nodding trillium)
Trillium erectum (purple trillium)
Trillium viride (green trillium)
Ulmus thomasii (rock elm)
Utricularia cornuta (horned bladderwort)
Utricularia intermedia (flatleaf bladderwort)
Utricularia minor (small bladderwort)
Vaccinium corymbosum (highbush blueberry)
Vaccinium macrocarpon (large cranberry)
Vaccinium oxycoccos (small cranberry)
Valeriana uliginosa (marsh valerian)
Valerianella chenopodiifolia (corn salad)
Valerianella umbilicata (corn salad)
Veronica americana (American brookline)
Viola canadensis (Canada violet)
Viola incognita (hairy white violet)
Viola primulifolia (primrose-leaf violet)
Viola viarum (plains violet)
Waldsteinia fragarioides (barren strawberry)
Woodsia ilvensis (rusty woodsia)
Zigadenus glaucus (white camass)

Source: IL. ENDANGERED SPECIES PROTECTION BOARD, 524 South Second Street, Springfield, Illinois 62701

